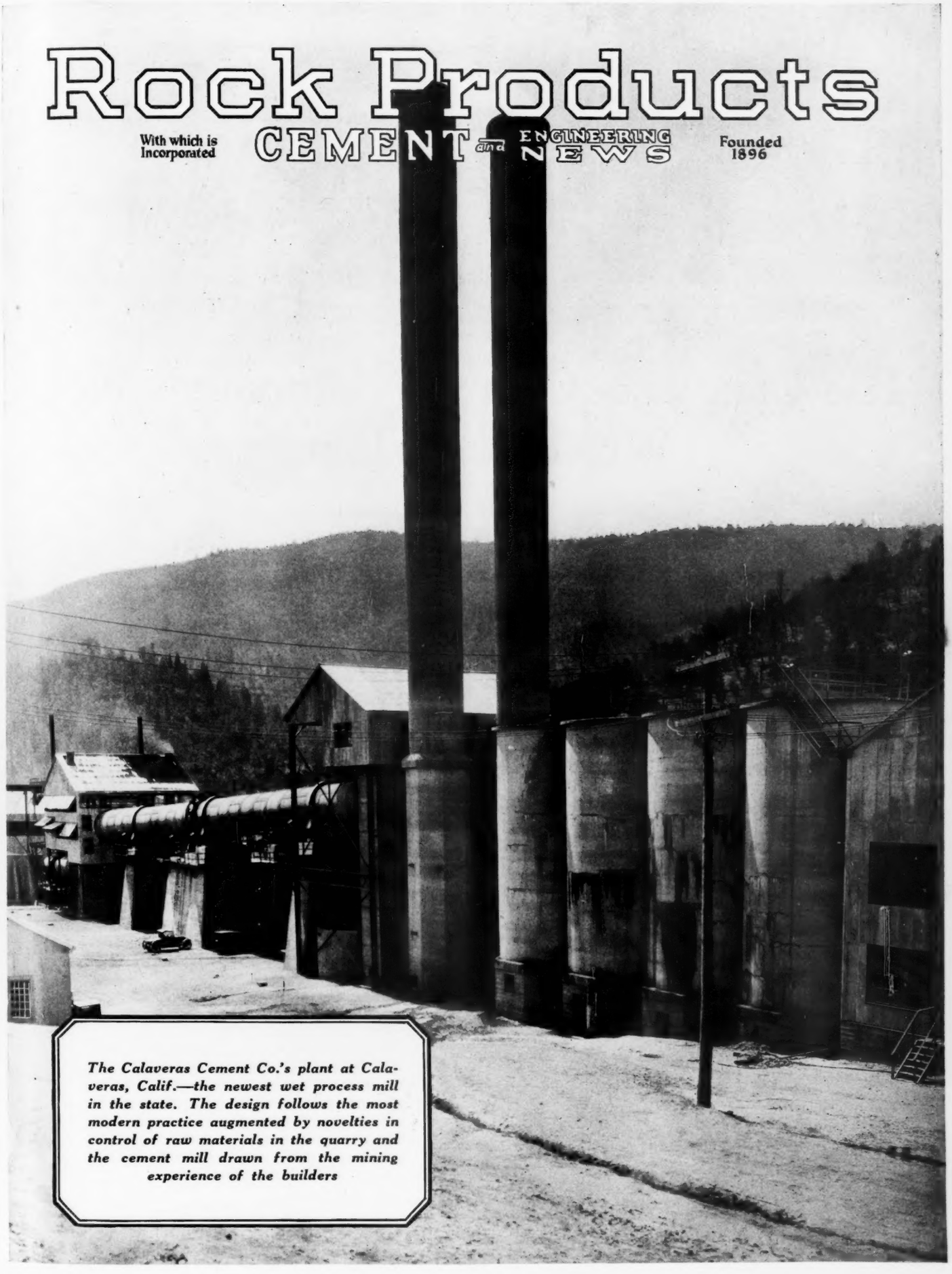
Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896



The Calaveras Cement Co.'s plant at Calaveras, Calif.—the newest wet process mill in the state. The design follows the most modern practice augmented by novelties in control of raw materials in the quarry and the cement mill drawn from the mining experience of the builders

Formal opening of the new cement mill at Calaveras, Calif. Fully 15,000 people, including employes and plant executives, took part in the day's celebration and barbecue luncheon

The Calaveras Cement Company's New Wet-Process Plant*

Experience of Mining Engineer Builders Applied to Portland Cement Manufacture

THE foothills of Calaveras County, California, still furnish cover for large coveys of quail and the higher mountains protect the deer and larger game, while the lakes and streams abound with rainbow and eastern brook trout.

It was in the fall of 1920, while hunting quail, that William Macnider discovered the deposit of limestone which is now being turned into portland cement by the Calaveras Cement Co. During the winter of 1920-21 other deposits were located in the vicinity, the extent of which assure the continuation of operations in this locality for many years to come.

Due to the peculiar geological conditions in this section these deposits had been overlooked. No record of these limestone deposits in this vicinity apear on any of the United States Geological Survey maps, and while the miners of former years undoubtedly knew of the existence of this limestone, to them it meant nothing, and it remained practically unknown until Mr. Macnider's discovery.

From the time of the discovery of the first deposit, efforts were made to secure options on all of the property involved, but it was not until late in the fall of 1922 that the entire properties which were desired were under option. Preliminary surveys of material, assays, and tests were made of all of the limestone deposits and the surrounding shale during this period.

Thorough Exploration of Deposits

In December, 1922, William Wallace Mein and his associates became interested and a thorough examination of the properties was started, which resulted in the digging of some 18 miles of trenches across the various deposits, some five months of drilling for testing the depth and the interior qualities of the deposits and the driving of a 7-ft. tunnel more than 700 ft. long. In short, the deposits were examined and tested in the same manner employed for a precious-metal-mining property.

When the quality and extent of the deposits had been definitely proven, it became necessary to arrange for transportation facilities. The Southern Pacific Co. was operating a branch line from Lodi to Valley Springs. The terminus at Valley Springs had been the seat of great activity during the mining days in Calaveras county, but with the closing of the mines this activity grew less and less until Valley Springs became nothing more than the end of a pair of rails.

In 1924 surveys were made with the idea of extending this branch to the site of the proposed cement mill. While the distance was only 12 miles, the character of the country made this a rather costly undertaking. Finally construction was assured, but delays were encountered and it be-

Drilling, loading and track laying are carried on simultaneously at the Calaveras Cement Co.'s quarry

*Contributed by J. V. Baumgartner, Calaveras Cement Co., San Francisco, Calif.

Gasoline engine with loaded cars on the way to the crushing plant

came necessary to haul in material for the construction of the mill by truck. Actual construction of the mill started in May, 1925, all of the material being hauled from Lodi or Valley Springs over the same road that mining materials and supplies had been hauled over 60 years previously.

Railway Built to Calaveras

On Christmas Eve of 1925 the first locomotive, with its train load of machinery for the mill, arrived at Calaveras, the railway station of the Calaveras Cement Co. The 12 miles of railroad had cost a trifle over $900,000. From that time on construction work progressed more rapidly until the 9th of May, 1926, when the plant was formally opened.

This was the first manufacturing establishment in Calaveras County, and the Calaveras County Chamber of Commerce, in conjunction with the chambers of commerce of the adjoining counties and other local civic bodies, staged a barbecue. The day was given over to celebration and the mill employes, together with the executives of the company, spent the entire day mingling with the 15,000 people who accepted the hospitality of the inhabitants of Calaveras County on that day. It was fitting and proper that such a crowd and such a celebration should have been held on the very spot where Bret Harte and Mark Twain had mingled with crowds of miners fifty years ago.

Some days following this official opening, the plant was put into operation and on the 2nd of June, 1926, the first clinker was ground. On June 14 the first train load of cement, consisting of six cars, left the most modern cement mill on the Pacific Coast and one of the most modern mills in the world.

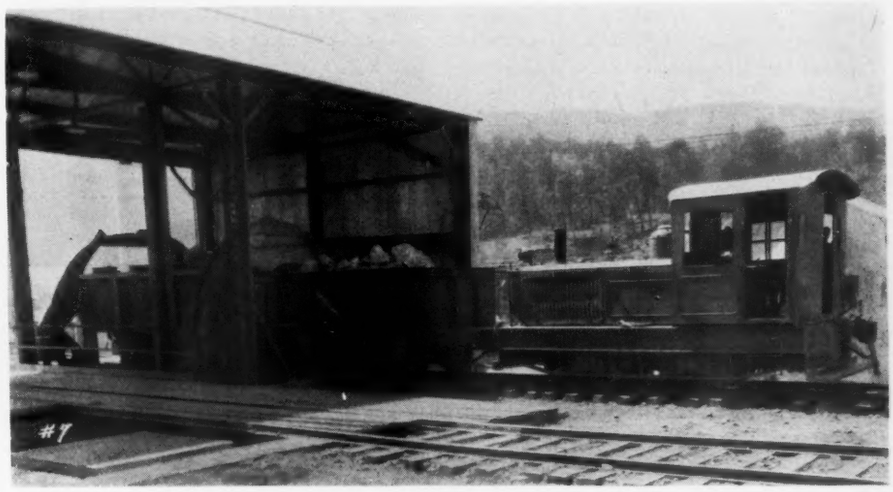
A uniform, high grade cement is being produced, which greatly exceeds all standard specifications, and the Calaveras Cement Co. is now numbered among the established cement companies of the United States.

The success of this enterprise is due chiefly to William Macnider and William Wallace Mein, of mining fame, and his associates.

Quarry Opening and Operation

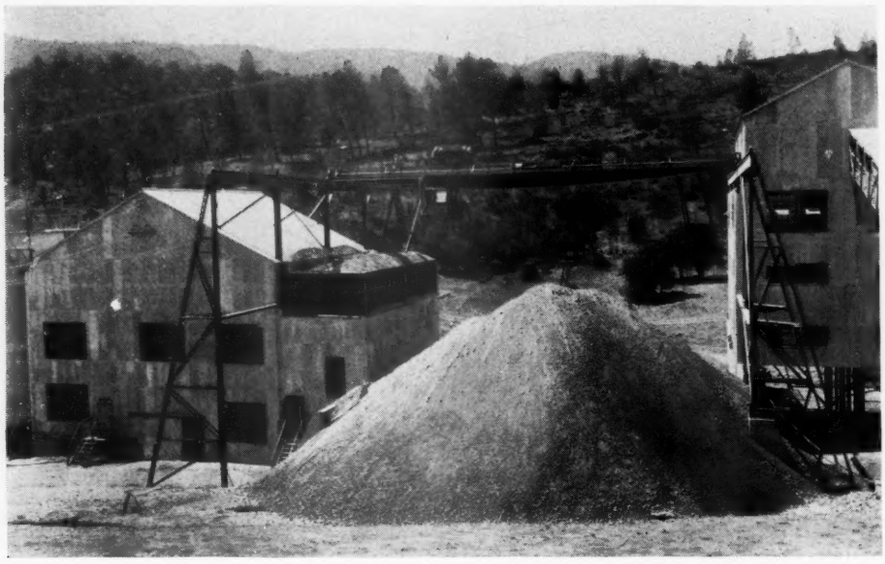
The quarries are so located that limestone and shale are transported to the mill on an easy downgrade, a distance of approximately half a mile.

Limestone in the quarry is loaded with a



Loaded cars entering rotary car dumper

Electric shovel digging and loading stone at the limestone quarry. The electric drill used for sinking holes shows in both views at the top of the deposit



Crushed rock storage. The travelling crane distributes or places the material directly into the raw mill bins

Bucyrus Model 60, electric drive, caterpillar shovel equipped with a 2½-yd. dipper. Quarry drilling is accomplished by means of an Armstrong churn-drill with electric drive, four Cochise air-hammers, and one Ingersoll-Rand Jackhamer. Shale is handled with a Bucyrus Model 14-B steam-shovel mounted on caterpillars. Twenty-ton cars are used, and two 19-ton Plymouth gasoline locomotives handle the rock trains with ease on the short haul to the plant.

A Western rotary car-dumper is used to tip the cars into a 42-in. Allis-Chalmers Superior McCully crusher having a capacity of 500 tons of limestone per hour. The crusher discharges to a 36-in. Jeffrey belt-conveyor 210 ft. long, inclined at 15 deg., which elevates the rock to a surge bin over the secondary crusher. A 10-in. Allis-Chalmers Superior McCully fine reduction crusher with 110 tons per hour capacity reduces the rock to 1½ in. and smaller.

Rock and shale are handled in the storage with a Milwaukee 80-ft. traveling crane, driven by three 50-hp. and one 10-hp. motors and equipped with a 3-yd. Hayward clam-shell bucket. The storage has sufficient capacity to make 26,000 bbl. of cement. Rock and shale are deposited from the storage direct into the compeb mill-bins in the proper proportion by this crane.

Raw Grinding and Slurry Handling

Two special Allis-Chalmers compeb mills, 26 ft. long, 8-ft. diameter in the primary compartment and 7-ft. diameter in the secondary compartment, reduce the material to 90% through a 200-mesh sieve.

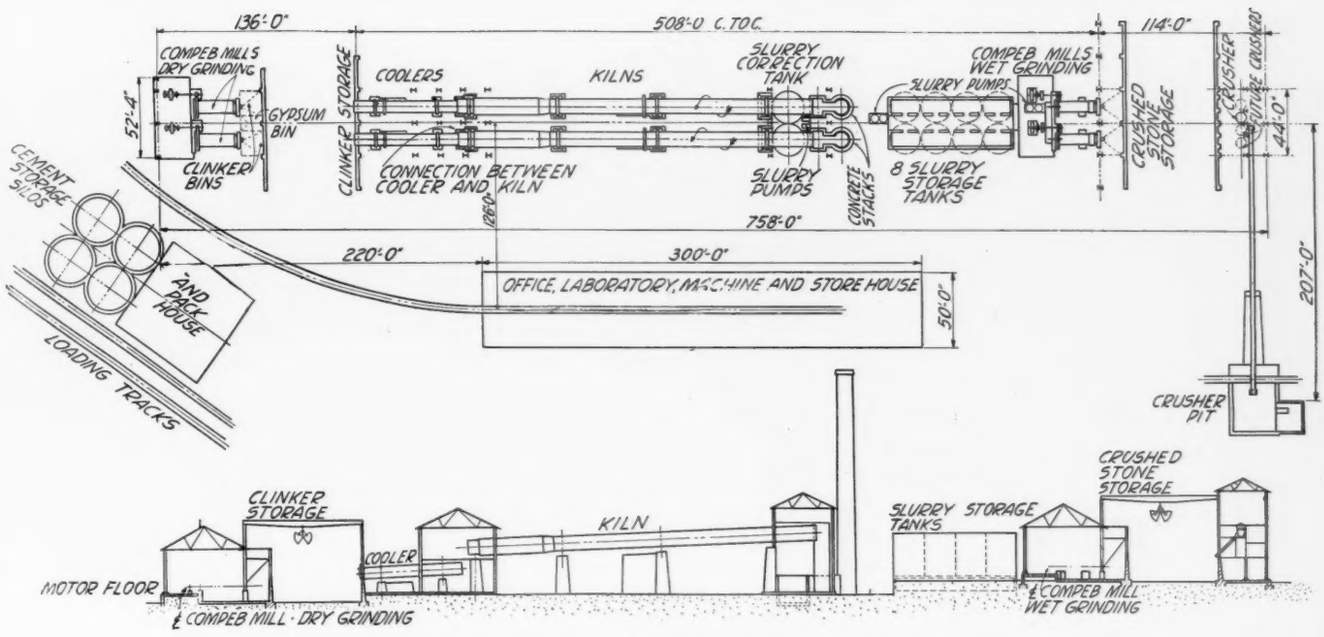
Two 500-hp., 2300-v. Allis-Chalmers synchronous motors working through Cutler-Hammer magnetic clutches are used to drive these mills. Sufficient limestone and shale to produce 75 bbl. of cement are ground through each of these mills per hour. The slurry, containing 32% moisture, is pumped from the raw mills to the storage silos by an Allis-Chalmers air-operated slurry pump.

One of the best features of this plant is the slurry-handling equipment, consisting of eight 28x40-ft. concrete, cone-bottomed slurry silos with basement underneath. Agitation of the slurry is accomplished by the slurry and air as it is pushed through special connections at the bottom of the cones. Three pipe-lines enter each silo, and they are so connected that slurry may be moved from one silo to another either by gravity or by a second slurry pump. It may also be circulated and agitated in the same tank by means of this pump. From these silos the slurry flows by gravity to the slurry correction tanks under the kilns, which are equipped with Dorr slurry mixers. From these tanks the slurry is carried to the kiln feeding devices by two 4-in. Wilfley centrifugal pumps. All the pumps are piped together so that they may be used interchangeably. Merco - Nordstrom lubricated plug valves obviate any difficulties from leaky or broken valves.

Kilns and Coolers

The two kilns are 10 ft. by 11 ft. 3 in. by 240 ft., mounted on four supporting trunnions each, and driven by variable speed motors. The kiln feeding mechanism is also driven by variable-speed motors, so synchronized with the kiln drive that the feed is regulated to the speed of the kiln without attention from the operator. Water-jacketed feed pipes are provided. Draft is secured by two concrete stacks, 9 ft. internal diameter by

General view of the plant showing the relative positions of the various mill buildings. The cement storage silos and pack house are at the right



Plan showing layout of equipment and buildings at the Calaveras Cement Co. mill

175 ft. high. The concrete flues leading to the stack and 75 ft. of the stack are insulated with fire brick. The rated capacity of the kilns is 1800 bbl. each per day.

Two 8 ft. by 71 ft. 6 in. coolers, mounted on two trunnions each and provided with lifters, cool the clinker and discharge into the storage, which has a capacity of 38,000 bbl. of clinker. This storage is served by an electric traveling crane, an exact duplicate of the crane used for raw material. Clinker and gypsum are distributed in the storage and placed in their respective bins by this crane.

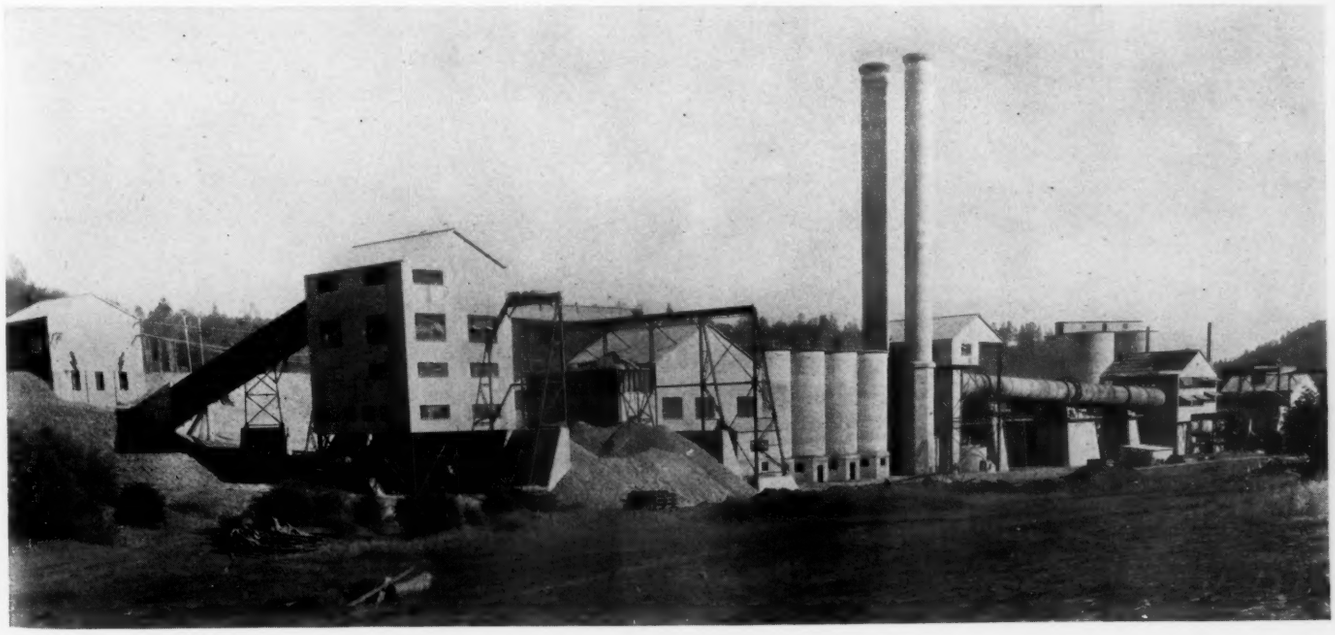
Finish Grinding and Cement Handling

The two finish grinding compeb mills, 8 by 26 ft., are driven by 650-hp., 2300-v. Allis-Chalmers synchronous motors. Feeding of these mills is done with table feeders on the clinker, and a ratchet and screw conveyor device on the gypsum. The cement is carried by a cross conveyor to either of two Fuller-Kinyon cement pumps which elevate and distribute it to any of the five 80-ft. concrete silos. Capacity of storage is 68,000 bbl.

Cement is recovered from the silos by four screw conveyors discharging into a cross conveyor. It is elevated from this conveyor to the packing machine bins. Two Bates 3-spout machines are provided. The bag house is adjacent to the packing department, and all facilities for cleaning, sorting, tying, etc., provided. W. W. Sly dust arresters are used in the packing department.

Power for this plant is provided by the Pacific Gas and Electric Co., which has built and maintains a fine substation at the plant, stepping the current down from 60,000 v. to 2300 v. for the company's transformers. There is also an auxiliary 17,000-v. power line connected to substation for use in emergency.

Water is pumped by a three-plunger pump to a 150,000-gal. tank on a nearby hill from the San Antone and Calaveritas creeks, and distributed from there to the plant and quarry. Compressed air is supplied by a 1300-cu. ft. free air Ingersolll-Rand compressor to the Jackhamers, slurry pumps,



Calaveras Cement Co. plant at Calaveras, Calif. Note the straight line design of the entire plant from crushing house to finish grinding mills

Fuller-Kinyon system, drill sharpeners, etc.

Supplementary Data

Cement men who have visited Calaveras during the construction period and after the plant was placed in operation have been impressed with the methods used in operating the quarry, particularly with regard to the comprehensive data which were obtained relative to the quantity and quality of raw materials available. This information will be of great value in planning future developments, and the accurate information available covering the analyses of the rock and shale will enable the plant chemist to further assist in the manufacture of cement by virtue of his knowledge of the materials quarried.

The cement plant represents a design which lends itself to expansion without extensive alterations to the initially built unit. The primary crusher is of such capacity that large stone may be fed to it, thereby minimizing secondary blasting in the quarry, and has ample potential capacity to take care of the quarry production if the plant is enlarged ultimately to several times its present capacity. The secondary crusher building is of such design that additional reduction crushers may be added to handle the ultimate increase in production without rebuilding the secondary crushing plant.

The idea of providing for future plant expansion has also been carried out in the construction of the plant in other departments. The crane used to load the raw compeb mill hoppers presents an efficient method of handling raw material, permitting an accurate proportioning of the raw materials, and provided for future expansion with a minimum of construction. The crane for loading the finishing mill bins has been installed, also to permit expansion in the finish grinding department.

Slurry Blending Facilities

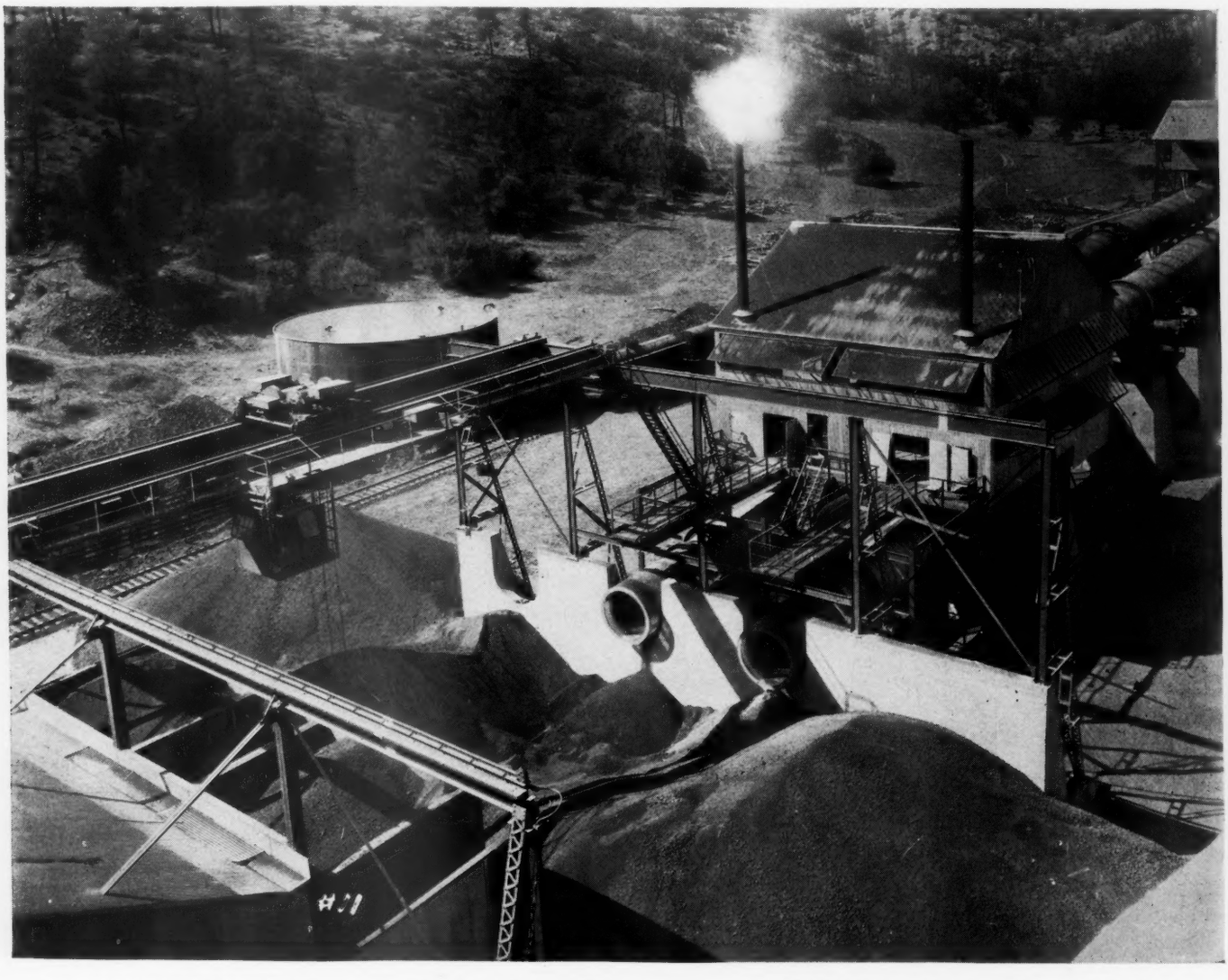
The slurry storage, which has been described heretofore, is so designed that a thorough blending of raw materials is possible, and the slurry storage tanks are connected and interconnected with pipe lines with complete valve control, which makes it possible for the chemist to determine accurately the quality of the raw materials at the point of entrance to the kilns.

The salient points, therefore, which are brought out in a design of this nature are found in providing for an efficient method of handling and control of raw materials, both in the quarry and at the plant; the provisions which have been made for plant expansion without disturbing the original operating unit, and the simplicity of the design throughout.

At this period of rapid developments taking place in the art of making cement, the problem of raw material control, both in the quarry and in the cement plant, are of paramount importance, and at Calaveras particular attention has been paid to building a cement plant which would enable the operators to follow the trend of the most modern practice.

No expense has been spared in making the plant safe for the operators, and safety devices on all machinery have been installed under the direction of experts.

The larger and more important machines are driven through gear reducers, giving to the entire plant from a mechanical standpoint an atmosphere of room and simplicity.



Cement clinker discharging to storage. The electric travelling crane serves to distribute the clinker and gypsum into their respective bins

Interior of pack house showing the three-spout packer. The sacked cement passes by conveyor belt to the warehouse. The view on the right shows a worker loading hand trucks from the end of the belt

The general plant arrangement and design were worked out by G. B. Poore, vice-president and chief engineer of the Calaveras Cement Co., in collaboration with the engineering staff of the crushing and cement machinery department of the Allis-Chalmers Manufacturing Co., then under the supervision of R. C. Newhouse, who is now vice-president in charge of engineering of the Cowham Engineering Co., Chicago, Ill.

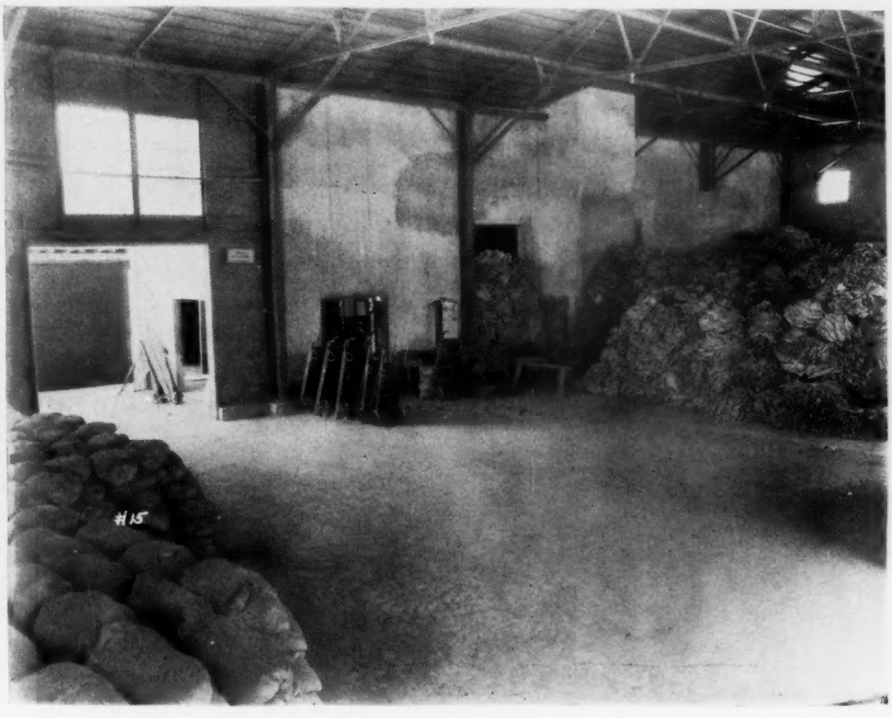
Personnel

Chiefly responsible for the success of this enterprise are men well known in the mining and cement world: William Wallace Mein, president; Stuart L. Rawlings, vice-president; G. B. Poore, vice-president and chief engineer; William Macnider, sales manager. H. A. Henry, a cement engineer with a successful record both local and foreign, has been engaged as superintendent of production. The chemical end is handled by H. J. Dunton, who has had extensive experience in Middle Western plants.

Study of Portland Cement

A PRELIMINARY petrographic study of portland cement carried out by J. L. Gillson and E. C. Warren is reported in a recent issue of the *Journal of the American Ceramic Society*. The investigators used clinker from five commercial brands of portland cement in their study. It was found that about 95% of the clinker in each case is made up of three different crystalline compounds. The optical properties on two of these were determined and found to be not the same as those of the members of the $CaO \cdot Al_2O_3 \cdot SiO_2$ system determined by Rankin and Wright. One of these compounds in the clinker was also found in set cement and concrete, showing that it is an inert substance without hydraulic properties. The most abundant constituent of commercial cement does not have properties closely similar to any of the synthetic minerals, the index of refraction being higher than that of $3CaO \cdot SiO_2$.

Chemical analyses of the fractions of the two major constituents were quite similar so no satisfactory conclusions of their composition could be drawn. The analysis suggests that these major constituents are calcium aluminum silicates. The study will be extended further towards some sort of definite knowledge of the constituents.



Bag handling room adjacent to the packing department where bags are cleaned, sorted, repaired, tied and stored

Registered trademark appearing on every sack of cement

Pneumatic Conveying of Gritty Materials

By Edward J. Tournier, M.E.

THE recovery of dust and the eliminating of dust are problems frequently met in conveying cement, lime, gypsum, sand, small gravel and other rock products.

The solution of these problems affect a number of industries dealing with various rock products, the most advanced being cement manufacture and the separation of dust from coarse materials. Handling glass sand, fine roofing gravel, rock fertilizer and furnace slag are applications of pneumatic conveying which serve to demonstrate the possibilities of this system.

There are a few fundamentals which determine the efficiency and successful operation of any pneumatic conveyor. One of the most important is that the materials to be handled must be dry. Another is that the size of lumps must be limited. Still other elements have to do with the selection of apparatus for a specific purpose. The various principles will be discussed as they appear to affect the different classes of materials under consideration here.

General Principles of Pneumatic Conveying

In handling fine dry materials, or those composed of fine and comparatively small pieces, pneumatic conveying provides a solution for many problems. For handling fine ores, or even those containing small lumps, there is an increasing possibility of usefulness for this system. This is particularly true where the materials must be carried considerable distances, providing, however, that the capacity does not exceed 30 or 40 tons per hour. In the past, when air velocities in conveyor ducts did not exceed 100 or 150 ft. per second, the power requirements for handling materials weighing over 50 lb. per cu. ft. were too great to permit extensive applications of the system. With velocities up to 300 ft. per second it is possible to increase considerably the effectiveness of pneumatic conveyors, and to handle materials weighing 450 lb. per cu. ft.

Modern engineering practice in air conveying has developed three principal types of apparatus of wide application. Two of these are operated by a partial vacuum and the other by aeration and pumping of the material. The latter is the Fuller-Kinyon system designed by the Fuller Co., of Catasauqua, Penn. The vacuum systems are those designed principally by the Dust Recovering and Conveying Co. of Cleveland, and also by the Guarantee Construction Co. of New York.

In connection with the pneumatic conveyors, it may be noted that there is no agreement among engineers as to the amount of vacuum that is required to move a given amount of material over a predetermined distance. There is therefore a difference of opinion as to horsepower requirements and as to the proper size of conveyor ducts. These differences have led to the development of what is termed "low vacuum" and "high vacuum" systems. The system advocated by the Guarantee Construction Co. is of the low vacuum type, while the Dust Recovering and Conveying Co. uses both types, depending on the material handled and other factors.

Recent designs of vacuum systems developed by the Dust Recovering and Conveying Co. for handling dry materials are made in four principal forms, depending on dust content, local regulations and the value of the dust. The first two types are not suitable to materials containing dust and will therefore not be considered here.

The essential parts of a pneumatic conveyor for handling dry and dusty materials are an air duct, a suction line, a receiver, a blower or vacuum pump and a filter. The purpose of the receiver is to reduce the air velocity which allows heavy particles to drop out and protects the pump. The filter is used to retain the dust and prevent its escape to the atmosphere.

The equipment which for want of a better term is called a "low efficiency system" is highly satisfactory for a variety of purposes, but it cannot be used for materials containing fine dust because a plain receiver is not designed to remove all of the fine particles. They would be drawn through the pump and discharged with the air, incurring three objections, any one of which might disqualify the apparatus for the materials in question. The discharged particles may be too valuable to waste; they may be offensive in the surrounding air; if abrasive in their nature they will quickly impair, and eventually ruin, the air pumps through which they are drawn.

An installation designed to retain all of the dust values is known as a "high efficiency system." It is especially designed for situations where it is desired to keep the larger particles separate from the dust and fines.

In rehandling sand used in sand blast operations, the high efficiency equipment is valuable for separating the finely divided, broken grains of sand that are to be used again. In this case the discharge from the metal receiver is directly into the

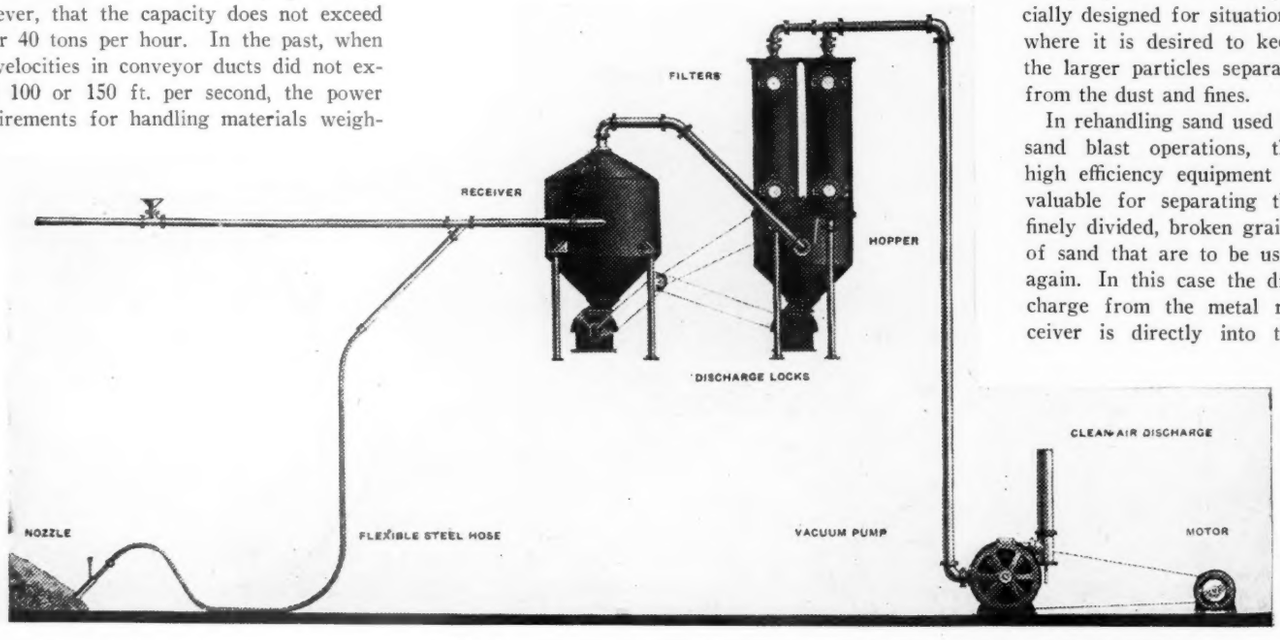


Fig. 1. Diagrammatic arrangement of a high vacuum system where coarse and fine materials are discharged at different points

sand blast machines, while the filter discharge is located where convenient for the purpose of disposing of the dust. The sand is thus rotated through a maximum number of blast operations without loss of efficiency.

The most modern and efficient system for handling materials is one in which all of the material must be retained and discharged at a single point. This equipment has the receiver identical with the foregoing type, but the filter, instead of being located over a separate outlet, is immediately above the receiver. The filter consists of two or more bag units, which are agitated periodically in rotation throughout the continuance of the filtering process.

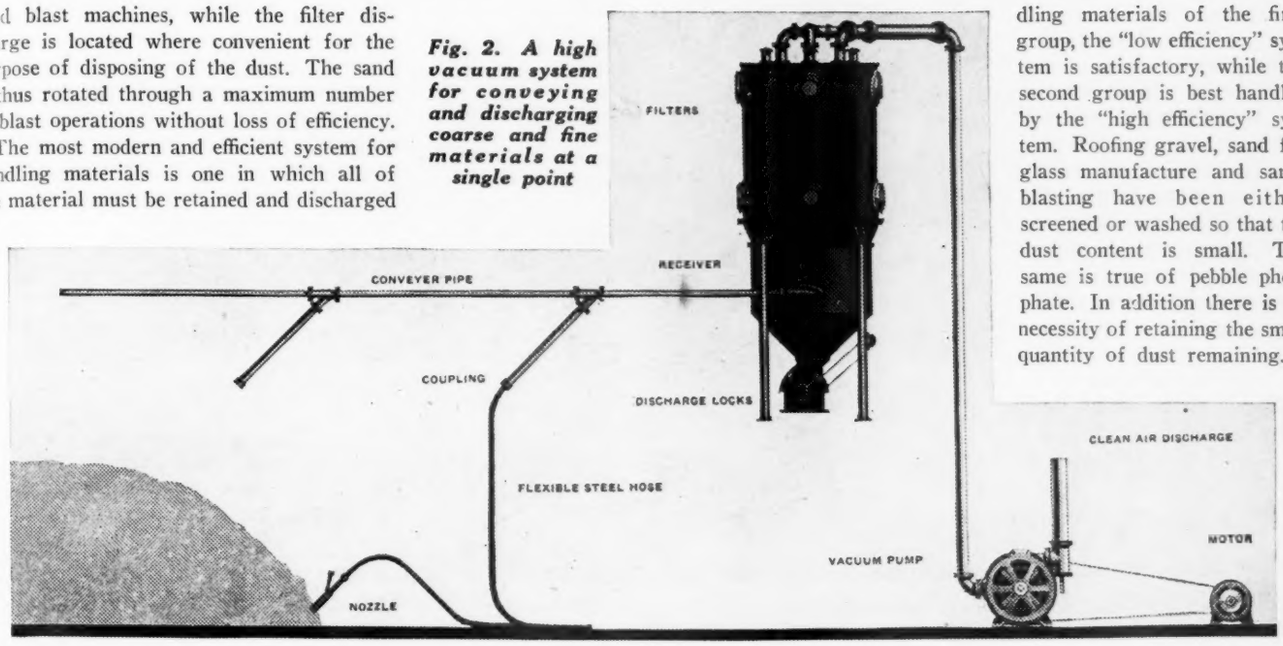


Fig. 2. A high vacuum system for conveying and discharging coarse and fine materials at a single point

One of the most important applications of this form of equipment is the pneumatic handling of portland cement in bulk, which is rapidly becoming an established practice. Retention of the extreme fines in cement is necessary in order to pass standard tests for fineness. If 1% or 2% of the finest materials were lost as would be the case with the design first described, it would have considerable effect on the amount of cement passing the 100- and 200-mesh screens which are used in making the test on the cement.

Application of High Vacuum System to Various Materials

The materials of interest to readers of Rock Products that can be handled successfully by pneumatic conveying are divided into two classes. Those in which dust is not an important factor, and those in which dust retention is a first consideration. In the first group are roofing gravel, pebble phosphate, sand and lime. The second group includes cement, talc and gypsum.

There is a specific type of equipment especially adapted to each group, and although only a few installations have been made, the general principles already described determine the form to be used.

In general, it may be said that for handling materials of the first group, the "low efficiency" system is satisfactory, while the second group is best handled by the "high efficiency" system. Roofing gravel, sand for glass manufacture and sandblasting have been either screened or washed so that the dust content is small. The same is true of pebble phosphate. In addition there is no necessity of retaining the small quantity of dust remaining.

An installation for handling such materials will therefore consist of the conveyor duct, suction pipe, receiver, filter and a vacuum pump, which is usually belted to an electric motor. Both the receiver and filter have a discharge lock which permits the separate discharge of coarse and fine materials. The same apparatus is also used in reclaiming sand that has been used in sandblast machines. A certain quantity of this sand is broken up in use, and the presence of this dust decreases the efficiency of the whole grains. By passing the sand through

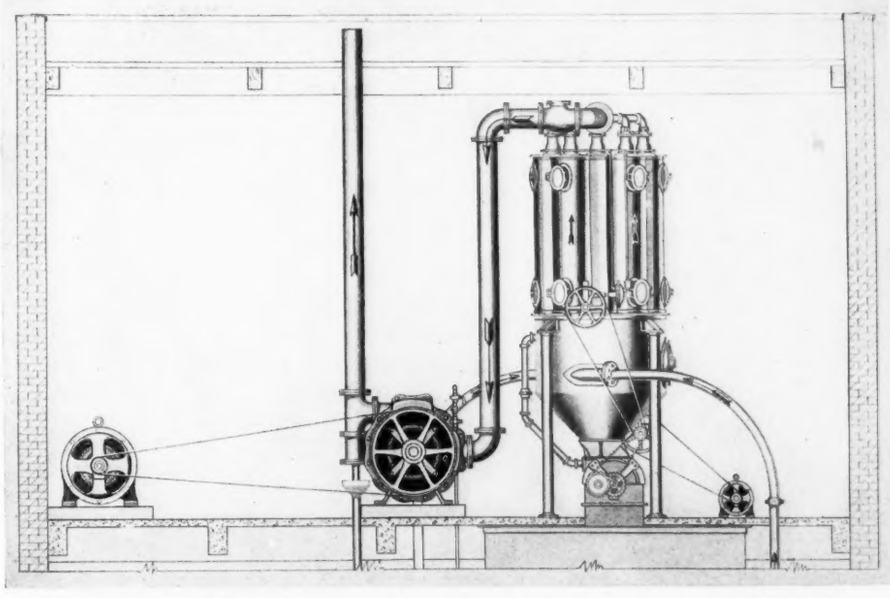


Fig. 3. Showing the arrangement of a high vacuum pump receiver and filters. Note the long bend pipe at right. This is typical of good design in pneumatic conveying

Fig. 5. Upper section of bag filter with outer cover removed. The filter bags suspended from the top of the casing and the bag agitator mechanism and pipe connections are shown clearly

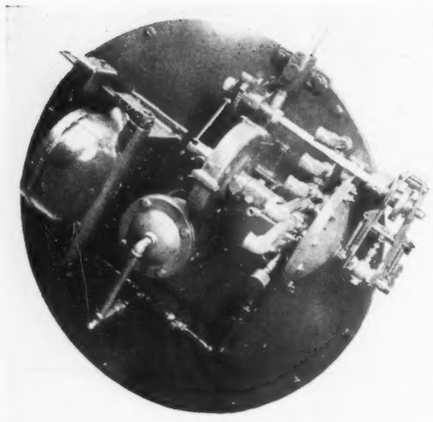


Fig. 6a. Looking down at the top of the filter. The timing mechanism and air pipe connections for regulating bag cleaning periods are clearly indicated

the receiver and filters, the whole grains may be collected at the discharge lock of the receiver and the dust taken out through the filter lock.

Functions Performed by Various Units

The receiver used in both the high and low efficiency systems consists of a cylindrical steel tank with conical top and bottom sections. At the top of the tank there is a flanged connection for receiving the suction pipe and at the bottom of the lower cone there is another flange for attaching the discharge lock. Part way up the vertical section of the cylindrical body there is attached tangentially a sleeve with a flanged end for receiving the conveyor duct. The sleeve is made tangent to the circumference of the tank, because it has been found that this construction facilitates the entrance of air and material and by inducing a circular motion the separation of heavy particles is accelerated. The entrance to the receiver is the point of greatest impact and the circular direction imparted to the air current by the tangential intake helps to reduce the abrasion of the materials held in suspension. In order to effect repairs and renewals of parts at this point a removable wearing plate of steel is bolted to the flattened side of the intake sleeve.

The first separation of the coarse and fine particles contained in the air current is made in the receiver. The principle involved here is the relation between velocity of the entering stream and the volume of air in the receiver. The velocity of the air decreases in proportion to the relative cross sections of the air line and the receiving chamber. Gravity carries the heavy particles to the cone shaped bottom of the receiver whence they are discharged through a suitable automatic lock. The dust is drawn through the suction line at the top of the cone, thence to the filter, from which it is drawn by the vacuum pump.

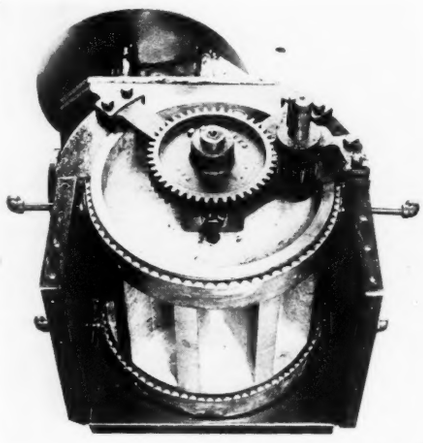


Fig. 7a. Automatic discharge lock for use with non-abrasive materials

The second separation, which consists in retaining the dust, is made in the filter. This may be a unit containing from two compartments to 10 or more, depending on the efficiency required. It is principally in the multiplicity of its filters that the high efficiency system differs from the low efficiency type.

The filter consists essentially of a cylindrical steel tank, filter bags, a mechanism for operating and timing agitation of the filters and a discharge lock with automatic control. The tank is made with a conical bottom to facilitate the discharge of materials. The top is made flat to accommodate the timing and filter mechanism.

The mechanics of these filters is best explained, perhaps, if the process of their operation is described. The stream of air drawn from the receiver is passed upward between the filter bags suspended in the vertical section of the tank. The dust is deposited on the inside of the filter and clean air is drawn through the fabric of the bags to the outlet manifold at the top of the tank and thence through the vacuum pump to the atmosphere.

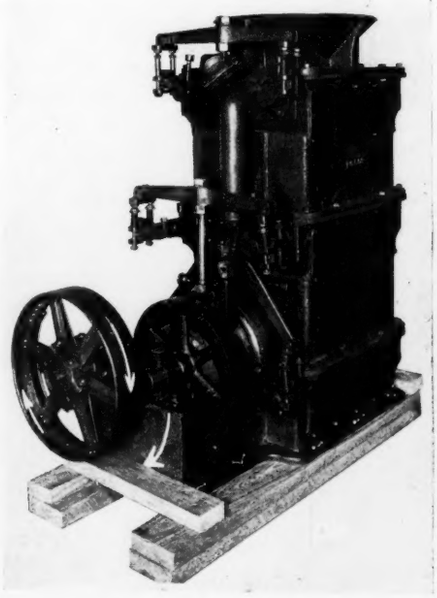


Fig. 7. Automatic discharge lock for use in discharging abrasive materials from receivers or filters

In order to prevent clogging of the fabric of the filters the dust adhering to it must be removed. This may be done mechanically by agitation of the bags or by means of a high velocity air current.

One bag compartment at a time is cleaned, and is automatically cut off from the air line during the process. The cleaning is

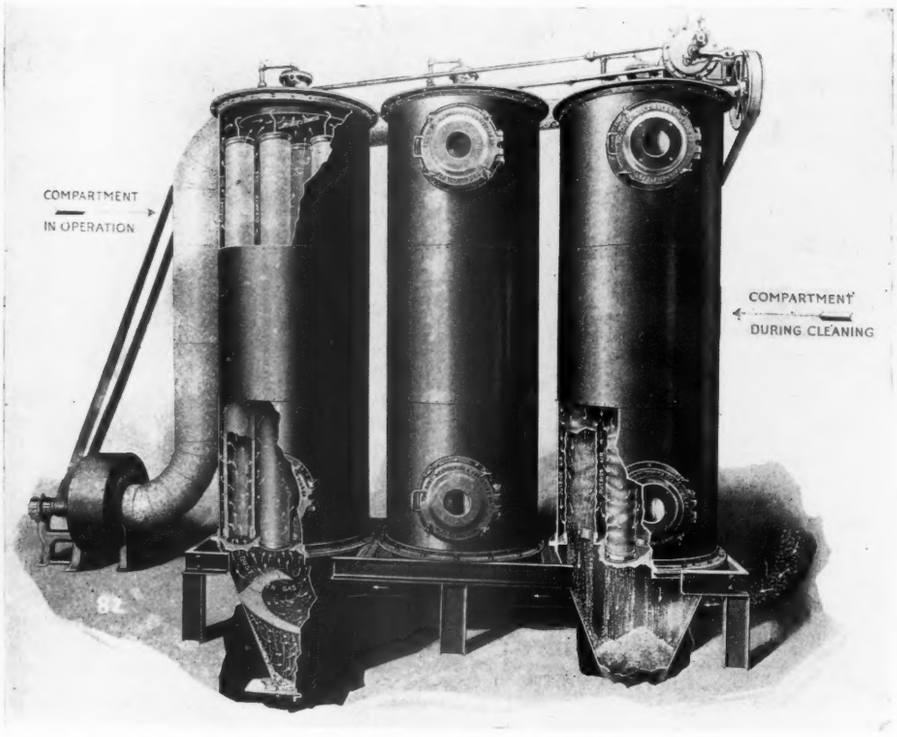


Fig. 6. View of filter compartments, showing the interior construction and the flow of materials and air

periodical and is controlled by a timing device as is also the number of cleaning periods. Regulation of the time element is such that each compartment can be cleaned once every two minutes or once in an hour, depending on the nature of the dust handled.

Agitation of the bags is accomplished by means of a compressed air motor of special design and a rod plunger mechanism. After the compartment that is to be cleaned is cut off from the air suction line, outside air is drawn into the filter compartment through the air valve on top of the filter housing and passes through the fabric of the bags. In this case the air passes in a direction opposite to the dust laden air, thereby preventing particles from penetrating the filter bags during shaking periods. It also helps to force the dust down into the filter hopper.

The rotary discharge lock is a device used for automatically unloading receivers or filters while under air pressure without stopping the suction pump. Discharge locks are made in two types, depending on whether they are for use in abrasive or nonabrasive materials.

The essential parts are a cast-iron or sheet steel receptacle within which is housed a cast-iron or steel rotating vaned drum. The vanes are arranged so that the space between them form pockets and the web between the pockets acts as a seal between the bottom of the receiver and the body of the receptacle. The drum is rotated by means of a pair of gears mounted on a shaft which takes its power from one of the counter shafts of the filter shaking mechanism.

As an operating condition, in any pneumatic conveying or unloading system, it is of the greatest importance that the intake or "unloading tool" shall be readily brought to the material. It should be easily done by one man, and is possible with a 3-in. or 4-in. suction hose, which is also sufficiently flexible to permit easy manipulation.

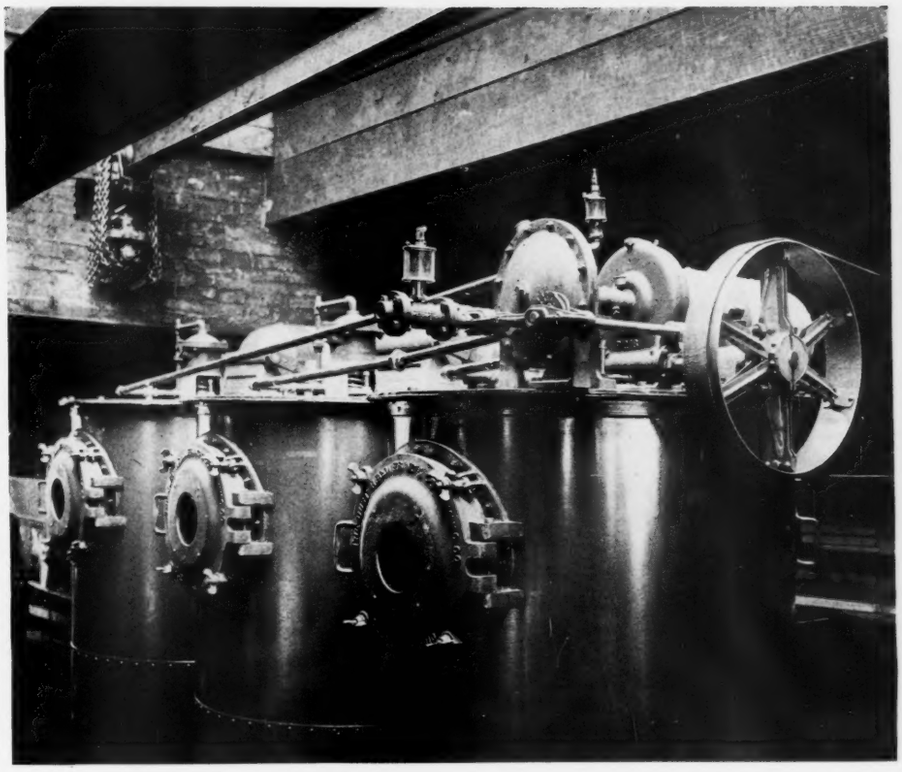


Fig. 6b. Three-compartment filter, timing mechanism, bag shaker and belt transmission for driving apparatus

In giving consideration to the type of equipment to be used, whether high vacuum, the class of service and manner of use is of great importance. Where conditions are such that material will always be fed into the conveyor duct, it is generally advantageous to use a low vacuum installation because of the lower power required. In this case also a flexible intake is not required. This type requires a comparatively inexpensive air pump, as compared to vacuum pump required for the high pressure system. The size of pipe required, however, is so much larger that it cannot be handled in restricted spaces. In some instances a pipe for low vacuum installations may be 12 in. in diameter. An intake hose of such a size would be so stiff and heavy that it would not be easily portable and therefore unsuited to unloading cars.

In cases where vessels must be unloaded the question of pipe size is also of much importance since tidal differences must be overcome. It is evident that here a high vacuum system with a small diameter pipe is the more advantageous of the two.

There is finally the consideration to be given to the difference in cost of the two systems. The high vacuum installation on account of its more rugged and accurate construction is considerably more expensive than the low vacuum type. Any offsetting features of the latter must therefore be taken into account in reaching a decision. Such decisions are of course best left to the specialists in this branch of engineering, to whom specific problems are submitted.

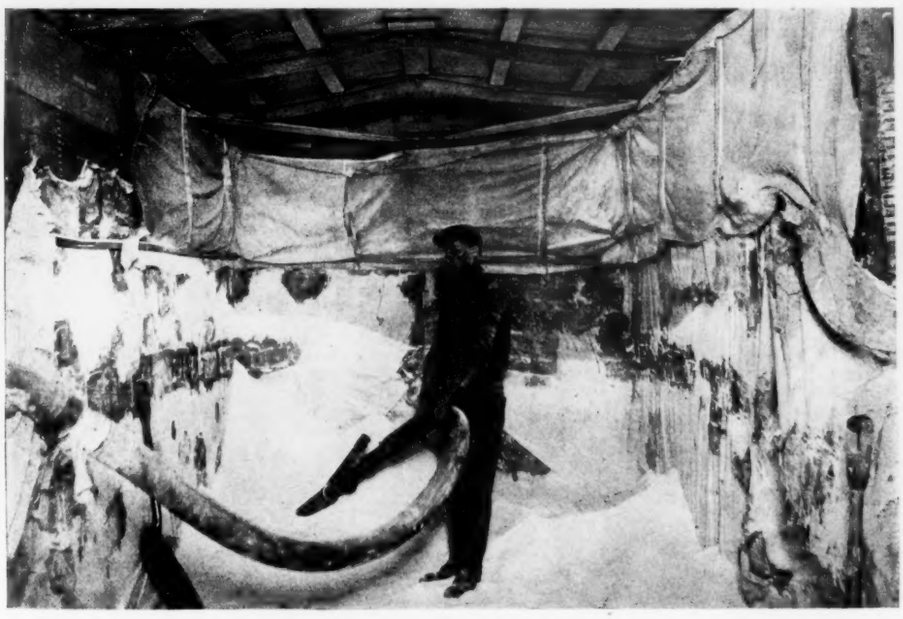


Fig. 8. For economical operation the "unloading tool" or suction nozzle must be light enough for one man to handle

Horsepower Requirements of Pneumatic Conveyors

While it is true that the theoretical pressure and horsepower required to move a given amount of material may be calculated, the frictional resistance in each case is different, and the final result may vary 100% from the true result. It would seem, therefore, that due to imperfect knowledge of some of the necessary factors, agreement of

two sets of calculations from different designers for pneumatic conveyors is improbable.

It has already been indicated that a great difference of opinion exists in regard to power requirements, air pressures, etc., due to the lack of certain technical data. The results of some observed conditions in plants handling various materials by the high velocity system, however, indicate that an approximation of probable power maxima may be made. In presenting such data it should be understood that they are not universally applicable. For any specific case it would still be necessary to consult reliable constructors of pneumatic conveying equipment. Like all approximations, they must be considered with care.

The general figures given below are based on actual performance in an aggregate of some 50 plants, mostly in unloading materials from cars. We quote as follows from information supplied by the Dust Recovering and Conveying Co.: "For capacity of 20 tons per hour the horsepower is practically the same for any kind of material. The capacity allows for time lost in cleaning cars and switching. If material is fed into line, for instance, from a bin, add 25% capacity for horsepower given below."

Capacity	*Distance*	*H. p.*	*H. p. per ton per hour*
Twenty tons per hour	50 ft.	50	2.5
On any kind of	100 ft.	60	3.0
Material—light	150 ft.	75	3.75
Or heavy	250 ft.	90	4.5

Physical Condition of Materials in Relation to Pneumatic Handling

There are certain industries where the work attending all handling operations are distasteful, and even dangerous to workmen. This is especially true of soda ash, lime and similar products. The handling of such materials as paper-making clay also presents a problem which is most economically solved by the pneumatic system. There are also processes in industry in which the materials to be handled require careful analysis as to treatment before being conveyed. Accurate information must be obtained as to the best physical condition of the materials for successful conveyance, as well as to the most efficient means for conveying. Specialization in engineering is now making it possible to determine with exactitude the proper equipment to meet the most rigid specifications required by the process in question.

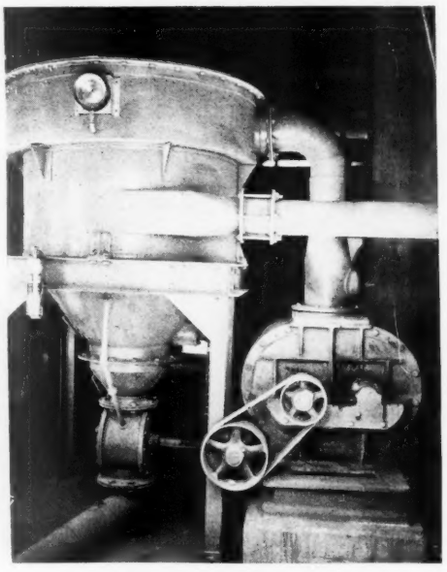


Fig. 11. The principal parts of a low vacuum system. Note the difference in filter and vacuum pump compared with Fig. 3. The tangential entrance of the conveyor duct directly over the pump is typical of both low and high vacuum installations

Each problem should be analyzed individually, owing to local conditions and other factors. In any case under consideration, materials to be handled must be dry. Dry materials may always be conveyed more economically than wet, or moist products. The inference is that in case where materials have been conveyed over long distances in a wet or a moist condition and afterward have been dried, a preliminary drying would have been more economical. Materials that must be dried at some stage of the operation should, with few exceptions, be dried before conveyance. If they are transported by rail, conveyors, trucks and shovels, less weight has to be handled, and if they are stored or moved in box cars during the winter months they cannot freeze. The same argument applies to crushing. As an instance, sulphur is generally shipped in lump form. This material could be much more easily and cheaply handled at destination if it were crushed at the shipping point.

It follows that with the complete data at hand the type and design of the equipment for handling a given material can be selected with reasonable expectations of successful results.

Preparation of Materials for Efficient Conveying

The use of pneumatic conveyors, both of the high efficiency and low efficiency types, in many cases, involves not only the transportation of materials but also the separation of the coarse from the fines contained in them. Handling materials such as roofing gravel, crushed lime, pebble phosphate, etc., require only an imperfect separation. Lime used for sand-lime bricks may be separated into coarse lime for slacking and the fines used for the manufacturing process. The same is true of crushed limestone fertilizer.

Handling pebble phosphate involves the conveying of considerable quantities of lump material, but it has been successfully accomplished.

A large eastern plant installed equipment for unloading phosphate rock and sand which they receive by water. The problem here was to reduce labor costs and losses due to spoil and dust, which cannot be avoided when unloading by means of elevators or grab buckets.

The installation was built for a capacity of 30 tons per hour and in a test run it delivered 32½ tons per hour through a hose 4 in. in diameter. The latter can be easily moved to all corners, under cabins, etc., by hand instead of by block and tackle as is required by larger suction hose. Power required by this equipment is about 60 h.p. The rock and sand handled are dry.

The Low Vacuum System

The preceding discussion of the high vacuum system sets forth certain general data which apply equally to the low vacuum system. There are no fundamental differences between them. The active principle in both cases is a partial vacuum, the mechan-

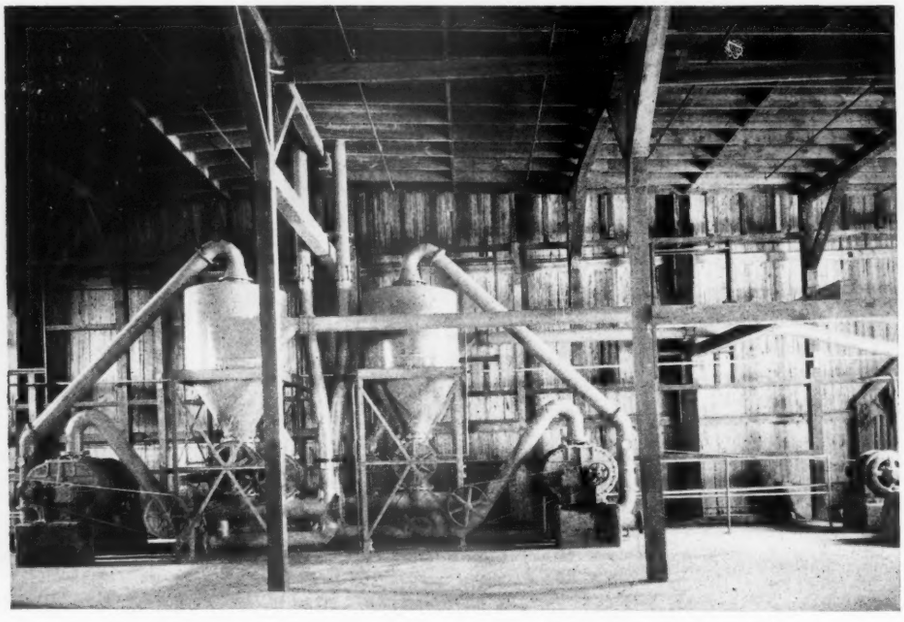


Fig. 10. A low vacuum system using two "cyclone" type receivers

ical units by which this partial vacuum is made to perform useful work are of the same general design and a positive action air pump is used for inducing the current in both cases.

Such differences as exist in the two systems be principally in the details of the units. Among these may be mentioned the methods of cleaning the filters, the interior construction of separators, size of conveying ducts and make of vacuum pump.

It is only when consideration is given to comparative velocities of air in conveyor ducts that any real difference is found. It is this difference which accounts for the terms "low velocity" and "high velocity" systems. In the latter the air current in the conveyor duct has a velocity of approximately 300 to 350 ft. per second, and in the former 150 ft. to 200 ft. per second. This variation does not involve a fundamental difference, but to some extent it does affect the size of the conveyor duct. High velocities generally permit the use of smaller pipes and suction nozzles, but also result in greater wear of the conveyor line.

The study of pneumatics has not yet developed laws similar to those of magnetism. The formulation of the latter has resulted in the modern squirrel cage motor with the torque characteristics of the wound rotor type. The various magnetic and frictional losses are known and subject to almost exact mathematical statement. The electric motor as designed will vary only by a small margin from the calculations.

The possible causes of frictional losses in air duct which carries materials are variable and are not subject to predetermination, as two carloads of apparently similar material will require different amounts of power for their conveyance.

The pneumatic system designed by the Guarantee Construction Co. of New York City is of the low vacuum type and differs from the other types described mainly in receiver and filter details. In most cases handling materials containing dust a single unit combining the functions of receiver and filter is used between the vacuum pump and conveyor duct. It is only where the two materials must be kept separate that a receiver is used in addition. This is usually a dust separator of the cyclone type preceding the filter.

The filter cleaning process is continuous as in other systems, but the bags are not agitated. In this case compressed air is used as the cleaning medium.

The considerations affecting pipe sizes as described elsewhere apply to this system of conveying, and so we find conveyor ducts and intake nozzles somewhat larger than in the high vacuum system. There is, however, the compensation of lower horsepower and wear on pipes and fittings.

Pumping Pulverized Dry Materials

As has been already indicated, finely divided, dry materials are being handled pneumatically, and although the capacities that can be transported are comparatively small, there is undoubted advantage in the flexibility, absence of dust and simplicity of construction afforded by this method.

The Fuller-Kinyon system, however, which accomplishes many of the same purposes as the pneumatic systems, is designed on a different principle. As was recently pointed out in Rock Products, this system "turns a characteristic that was a disadvantage and a nuisance to an advantage and a benefit." The reference is to the inception of the basic idea from observing the flooding of screw conveyors by finely divided particles of cement mixed with air.

The principal parts of the Fuller-Kinyon conveying system are a power driven pump a closed pipe line, a source of compressed air for aerating the material to be conveyed and distributing or diverting valves which switch the flow of material to any one of a number of receiving bins located in any desired place in the plant.

Various accessory refinements may be had, such as a refinement consisting of an automatic and remote control circuit, which automatically operates the diverting valve in sequence and indicates on the control panel the direction of flow at all times. The control panel is also provided with remote control push buttons so that the operator can modify the automatic sequence of operation and divert the flow to any desired bin in the event that one bin is being depleted more

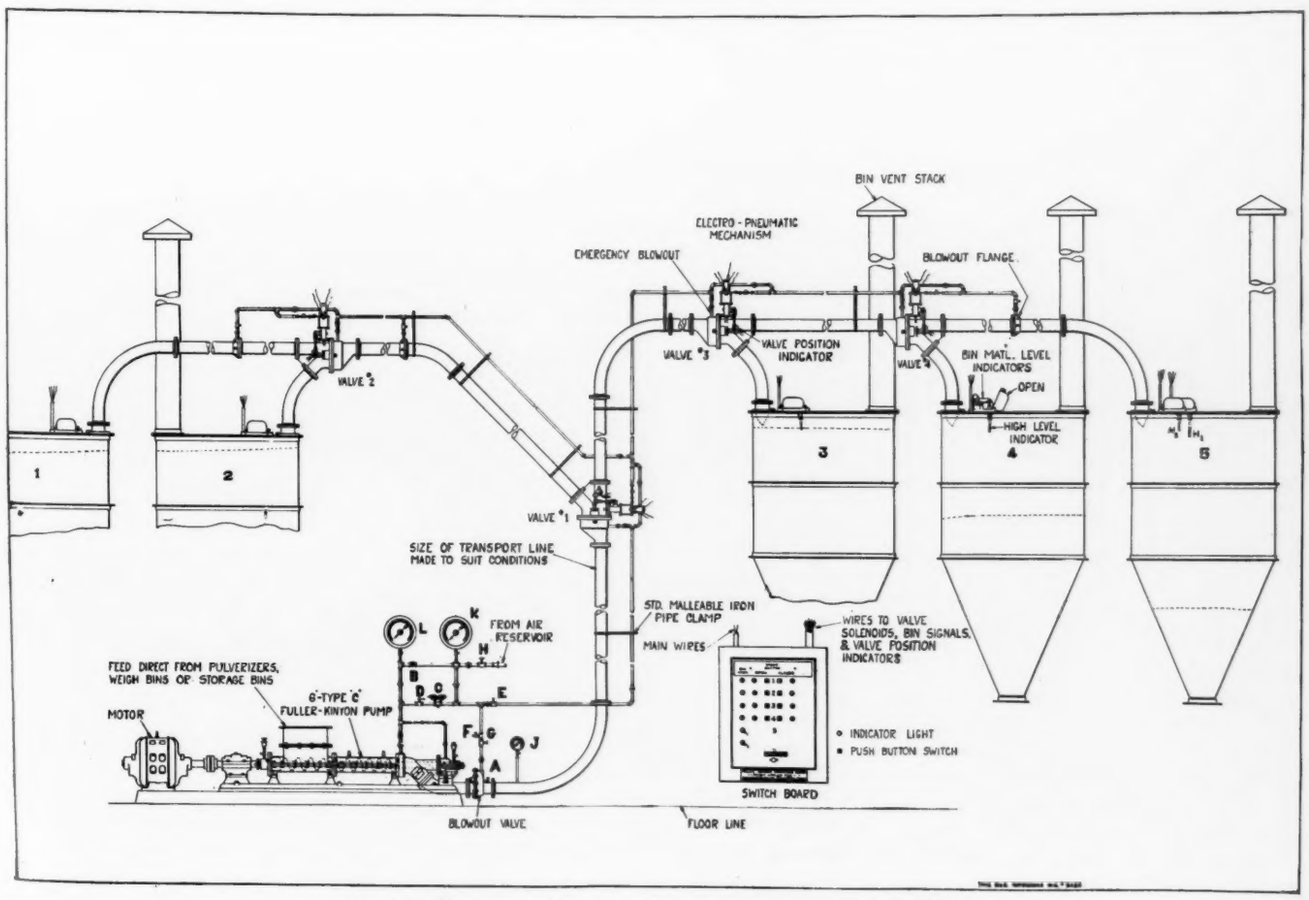


Fig. 12. Diagrammatic view of a cement pumping installation

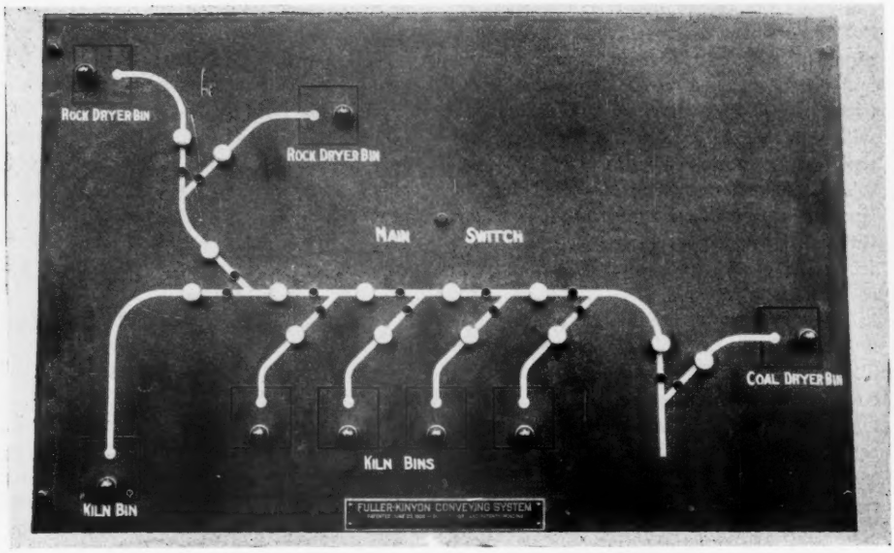


Fig. 12a. Diagrammatic view of electrically operated indicator panel and signal system used in connection with a conveying system

rapidly than the others. The automatic and remote control system is especially recommended in installations where there are a large number of small receiving bins and it is necessary to switch the flow of material at frequent intervals.

This system embodies four essential elements (Fig. 12):

A power-driven pump, the function of which is to control the feed and push the material through the conveyor line. A source of compressed air supply for aerating the material. A conduit through which the material is conveyed. Distributing valves which divert the flow from the main line to the various branch lines and thence to the bins.

A refinement which facilitates its operation is an electro-pneumatic indicating and remote-valve controlling device (Fig. 12a). By this the operator is advised when the material in each bin has reached a predetermined level by the automatic lighting or extinguishing of an electric bulb mounted on a central switchboard. On the same board is a series of push buttons through which switching valves are actuated. Thus the operator can effectually control the flow of material to any bin without leaving his station.

The pump (Fig. 13) consists of a specially designed worm or screw revolving in a closed casing or working barrel (*A*). The screw is mounted on outboard bearing uniquely designed to preclude the possibility of grit working into and injuring the bearing. Its design is such that the material is compressed as it is moved toward the end of the worm, thus forming a seal or check which prevents the backward flow of the compresed air used for aerating the material, which is injected through the air-ring (*B*) at the end of the worm. The pump is fed by gravity through the hopper (*C*), which may be attached either directly to the pulverizing mill, weigh bin, storage bin,

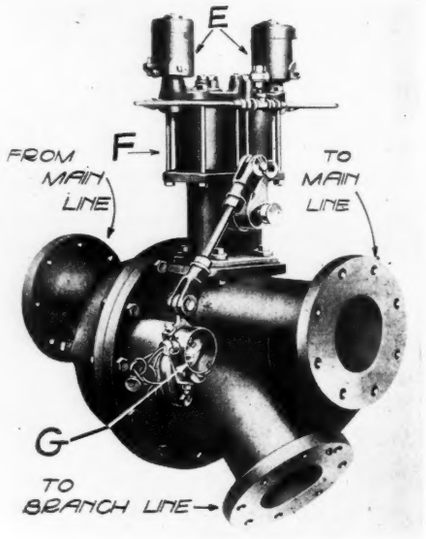


Fig. 14. Distributing valve in a particular type of conveying system

or at the end of a screw conveyor collecting the output of several pulverizer mills. The feed is carried to the discharge end of the screw, where the mass is aerated by a small amount of medium pressure compressed air which changes the nature of the material from a dense mass into a semi-fluid, in which state it is transported through the conduit to its destination.

The material in this fluent state appears to the eye as a solid, but upon agitation it shows all of the characteristics of a sluggishly fluent liquid. Obviously, the volume of the material in the conveyor line is considerably expanded relative to its initial compact condition, and this, in addition to the variation in the cross-sectional area of the discharge of the pump and the area of the pipe line, which is somewhat smaller, considerably increases the velocity. Accordingly, conveying is accomplished by the resultant of two pressures; that is, the pressure exerted by the screw acting against the column of material and the normal expansion of the gas used as an aerating medium.

Air for fluidizing the material is injected through the air-ring (*B*). The air pressure is governed by the reducing valve (*D*) and varies between 5 and 75 lb. per sq. in., depending on the nature of the material and the distance and elevation of conveyance. An air line, by-passing the pump (Fig. 12) parallels the conduit and furnishes the air supply for actuating the electropneumatic distributing valves. A blow-out valve at the end of the pump is used for clearing the transport line after the pump is stopped.

The conduit is usually built of block steel pipe, properly joined to provide a continuous smooth bore. The diameter depends upon capacities desired and ordinarily varies from 1½ to 8 in.

The line may be installed to follow the shortest or easiest route between the pump and the place of delivery. It may be supported in the most convenient manner—overhead, on the surface or underground. Bends, elevations or depressions and climatic changes do not affect the satisfactory operation of the system.

The distributing valves (Fig. 14) are disc multiple-discharge port type, electropneumatically operated and remotely controlled from a switchboard, conveniently located. To operate the valve the proper button on the signal board is pushed, which, by closing an electric circuit, energizes one of the valve solenoids (*E*). This solenoid lifts a pin valve from its seat, admitting high-pressure air to the corresponding air cylinder (*F*), moving the piston downward. This motion is transmitted to the valve disc through

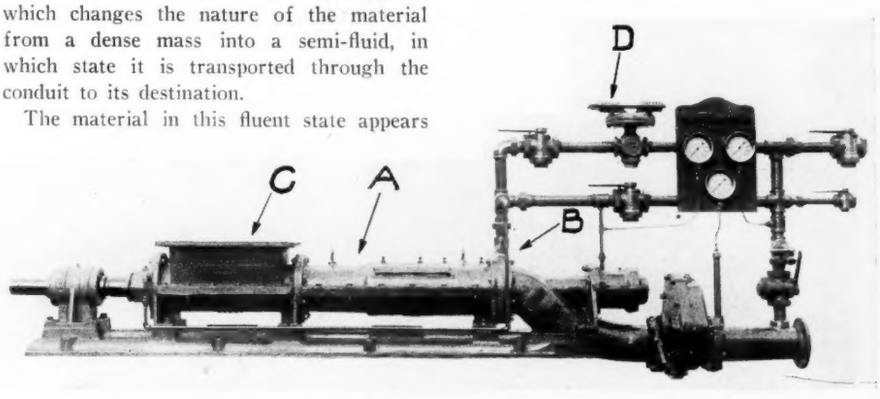


Fig. 13. Assembly of pump used in conveying system with pipe connections and air gages

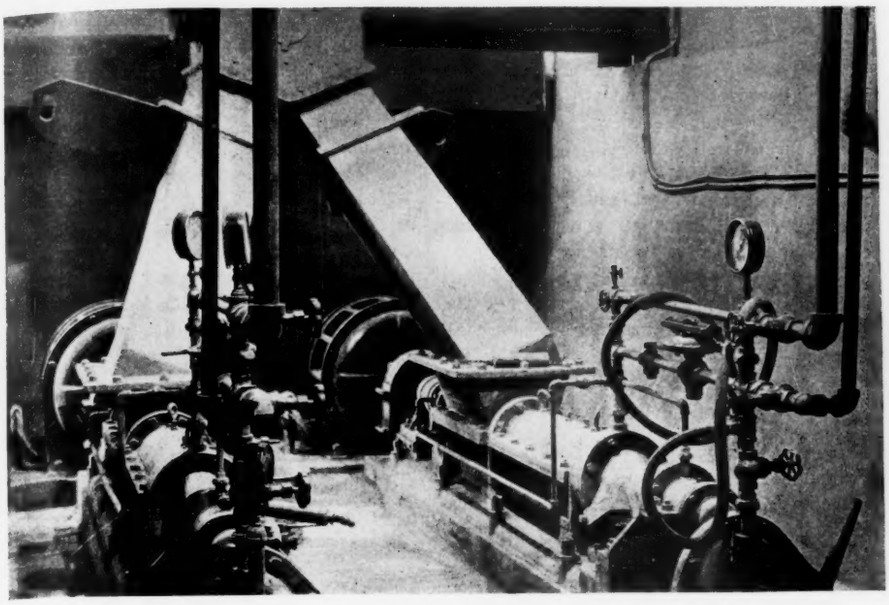


Fig. 13a. Close-up view of two cement pumps receiving from silos overhead

properly arranged shafts and levers. The disc is a flat, round plate with sharp, tapered edges which cut a clean surface on the seat, thus effectually sealing the port which is to be closed. The disc is supported, inside the casing, on a shaft, on the outer end of which is attached the operating lever which carries the "mercoid" switch (*G*).

The "mercoid" switch (*G*) tilts from side to side in harmony with the motion of the valve disc. It consists of a glass bulb, partly filled with mercury, and in which are two open electric circuits—one opposite the other in the line of motion. In each extreme position of the valve the bulb is inclined and one of the broken electrical circuits is submerged in mercury, thus completing a circuit which lights a lamp on the signal board advising the operator that the valve is set for the flow of material through the indicated port to the main or branch line.

Bin material level indicators (Fig. 15) are mounted in each bin. These consist of a paddle (*H*) pivotally suspended and connected to a mercoid switch (*J*), located in a dust-proof case on top of the bin. The paddle hangs vertically whenever the level of material is below its lower edge; in this position an electric bulb is automatically lighted on the switchboard. The paddle is pushed aside by the flow of material when the level reaches its lower edge; and it is held there so long as it is partly submerged. The deflection of the paddle tilts the mercoid switch, the light circuit is broken and the light on the signal board is extinguished. Simultaneously the tilting of the mercury bulb closes a second electrical circuit which automatically actuates the closing mechanism of the distributing valve, the branch line to the bin is closed, the main line is opened and the material passes on to the next bin.

Fig. 15. Bin level indicator and electrically operated switch on a conveying system

Any pulverized or finely divided material to be conveyed is advanced by the screw and compacted to form a seal against the rearward flow of the pressure air admitted through the air ring. The most important feature of the theory of operation arises out of the fact that most pulverized or finely divided materials can be rendered fluent by the injection of a quantity of air which seems to surround each particle in the form of a thin film which serves to overcome internal friction in the mass and friction against the surfaces of the pipe line or conveyor conduit. The ideal quantity of air necessary to form this fluent mass varies in accordance with the specific gravity and moisture content of the material, and the amount of air required to create it is also modified by the capacity of the system as some excess air must be admitted if large quantities of material are being conveyed at high velocities. In no case, however, does the quantity of air approach a condition wherein the material is car-

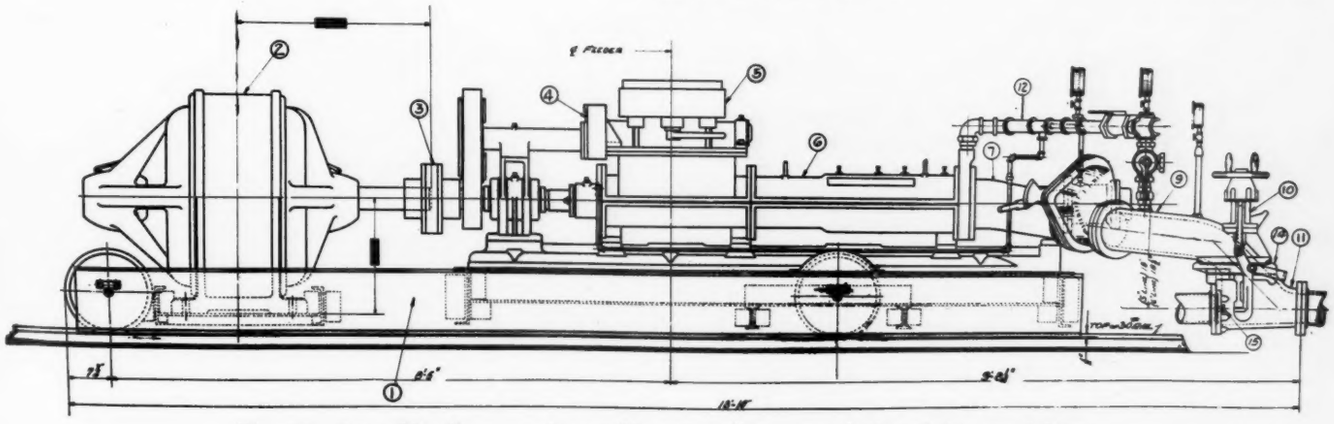


Fig. 16. Assembly diagram of portable conveying pump designed for special use

ried more or less in suspension. For that reason, this system will function with about one one-hundredth of the air necessary for conveying material by means of pneumatic systems.

In common with other forms of air conveying the Fuller-Kinyon system requires much more power for operation than most

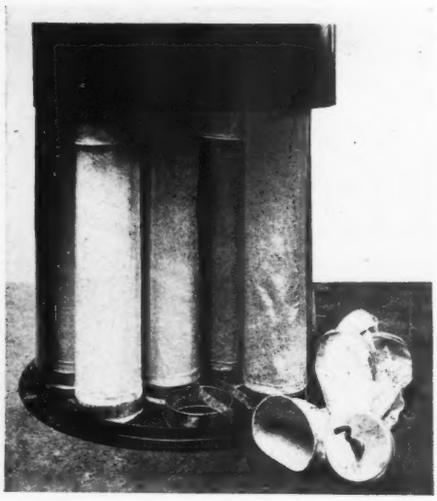


Fig. 19. Close-up view of filter bags of a high vacuum conveyor system

mechanical conveyors, and therefore the reasons for its use are to be sought in other directions. In dusty processes, of which cement manufacture is the most important, there are other factors besides power requirements to be considered in the selection of equipment.

Considered even in terms of dollars and cents, the difference in the power cost of a barrel of cement would be a small decimal, for handling say 10,000 bbl. from mills to stock house.

The elements of dust waste, labor difficulties, delays in operations, etc., which do occur in the best of mechanical worlds, to a large extent offset the increased power costs. And not least is the question of sanitation, which in all dusty operations, is one full of difficulties.

Capacity and Power Requirements

The handling capacity of the Fuller-Kinyon pump has not as yet fully determined, since so far it has successfully carried all the load placed upon it. In one case 125 tons per hour of cement raw material is being handled through a 6-in. pipe with a 45-hp. motor and a 10-in. pump. In installations now in service, the volume of material handled varies from 1 to 300 tons per hour, those at present transporting 300 tons handling finished cement.

The smallest size of conveyor duct used is 1½-in., handling one ton of cement per hour. Several of these small installations are in use receiving the spill from cement packing machines.

Reference to horsepower, air pressure, etc., in connection is attended by the same danger as in the case of pneumatic systems already cited. In addition, it is evident that elements such as the length of the line, number of lifts and bends, distributors and switching valves make no two installations alike. Each plant is a new problem which must be considered individually by those with the specialized knowledge for its solution. It will be noticed, however, that there is in this system the possibility that because the whole cross section of the conveyor pipe is occupied by the mixture of air and material less power is required and greater capacity may be handled than with pneumatic or vacuum conveyors.

Applications of the Fuller-Kinyon System

Aside from handling cement, any dry material that can be handled pneumatically can be conveyed by this system, if pulverized. Flue dust, alumina, bauxite, lime, gypsum, hot calcines, coke, etc., may be handled, if the mixture of finer and coarser material is not objectionable. The conveyor does not operate as a separator, but does tend to mix thoroughly combinations of materials fed it.

In addition to the stationary form of Fuller-Kinyon pump there is also a portable type devised for special use. The portable apparatus comprises a truck upon which a pump is mounted, and is commonly used under cement storage silos and for this reason a closure for connecting the pump hopper to the down spouts of the silo is provided. The closure operates by a movement of a single hand wheel and serves to seal the spout and pump against loss of material. Between the pump and the closure is a feeder driven by the same motor to insure a constant feed of material and guard the equipment against the shock of a flood of material in the silo. The pump discharges laterally to a conveyor line paralleling the track, through a second closure which is also designed to prevent the escape of dust.

The system cannot, at the present time, be used for unloading cars except in combination with a conveyor for delivering the material to the pump hopper. There is under development, however, an unloading device for use with the Fuller-Kinyon pump.

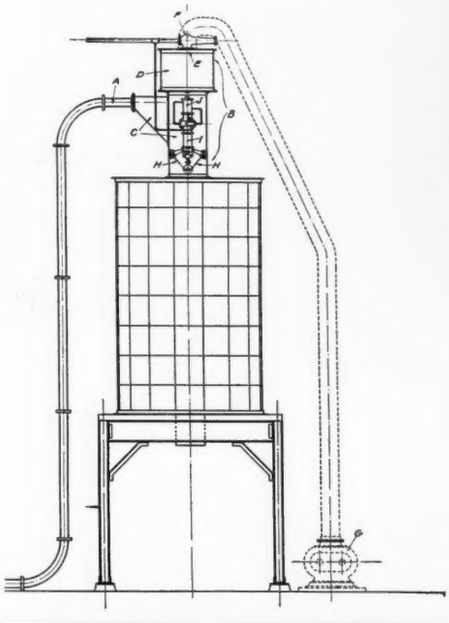


Fig. 17. Diagram of a recent development in pneumatic conveyors. A—Conduit or pipe line; B—Operating head; C—Accumulator zone; D—Suction zone; E—Outlet of operating head; F—Steam jet exhauster; G—Motor-driven rotary exhauster; H—Automatic gates; I—Hydraulic device for releasing gates; J—Device for restoring gates to original position

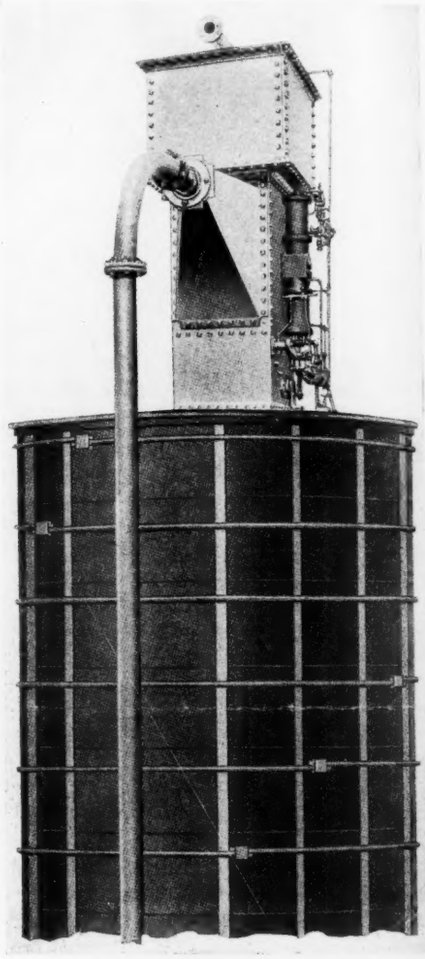


Fig. 18. View of dust separator in connection with the latest vacuum type installation

The most important use of the system comprises the transfer of material from pulverizer mills to receiving bins or cement silos, packing machines and the like. The small pumps are often used to receive the spill from packing machines and other uses where a small conveyor is needed to transport relatively small quantities. Very frequently pumps are used to convey material from a storage or weigh bin to receiving receptacles.

A New Low Vacuum System

The "Aro-Carrier" pneumatic conveyor, as manufactured by the Conveyors Corporation of America, Chicago, is the most recent development in the field of pneumatic handling of granular or similar materials. It oper-

ates on the suction or induction principle entirely, drawing the material through the desired distance to its destination.

The entire Aro-Carrier assembly consists of three principal parts:

First. The conduit in which the actual function of transfer of material is carried out.

Second. The interceptor, which is connected to the delivery end of the conduit and into which air and material are directly discharged and which, as its name implies, intercepts the material, permitting the air to pass on upward to

Third. The exhauster, or pump, which extracts the air directly from the interceptor, establishing a partial vacuum therein and indirectly, therefore, serves to establish the flow of incoming air through the conduit on which the material is carried from one point to its destination.

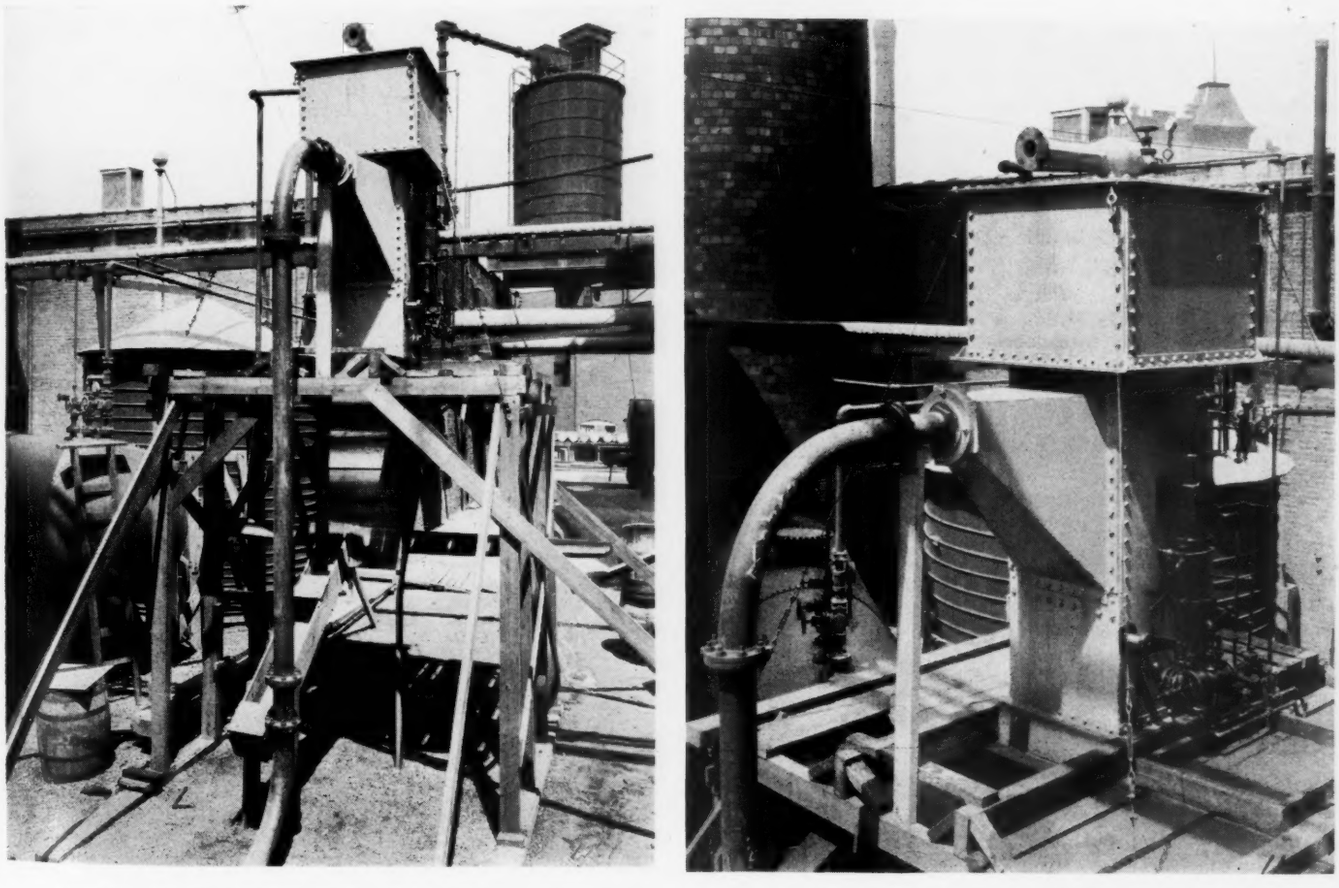
The conduit is circular in form and can be made of specially cast iron pipe or steel pipe, depending upon the quality of the material to be handled and the degree to which it causes abrasion.

The interceptor consists of a shell, which in standard form is constructed of steel plate, equipped with discharge gates at the bottom. During the actual function of transfer of material these gates are held in a sealed position, permitting the accumulation of material on them to a predetermined weight at which discharge is desired, and this point having been reached, release of the gates is automatically effected from the locking device which holds them in their sealed position, permitting them to open wide and discharge the contents of the shell or interceptor by gravity to a pile or tank below. Immediately after discharge has been effected, the gates are restored automatically to their sealing position whereby continuation of the actual function of transfer of material continues. Restoration of the gates to their sealed position, as well as locking them during the accumulation period, is effected through a specially designed mechanism mounted on the outside of the interceptor shell. A compensating device is also provided which makes possible establishment of the discharge operation at any weight desired from 100 lb. up, thereby acting as an automatic weight check, as well as conveyor. The operation of discharging and returning to sealed position of the gates consumes approximately ¾ to 1¼ second.

Fig. 20. Photograph showing to one-half size the dimensions of pieces carried by a pneumatic conveyor. The material shown in phosphate rock

The operation of the interceptor, therefore, consists of a recurrent cycle of accumulation of material in the shell, gravity discharge through the gates, and restoring of the gates to their sealed position until the succeeding accumulation brings about automatic discharge again.

To accomplish the establishment of the minus pressure condition in the interceptor shell, an exhauster is used. This can be of the reciprocating piston type, motor driven rotary type, or specially designed high efficiency steam jet type. The simplest form manifestly is the steam jet type. Consider-



Pipe line feeding operating head of vacuum type conveyor system. At the right is shown a close-up of the operating head, the suction zone of which is designed to trap any dust and discharge it with the other material

ing the fact that it has no moving parts and when all items entering into costs of operation, including fixed charges, are taken into consideration, the resultant cost of the total operation is little, if any, greater than that which would apply to the use of the first two types mentioned. If steam is available, therefore, the simpler form of steam jet exhauster should be given serious consideration and will undoubtedly be found to possess advantages over the others which make its adoption advisable. Where steam is not available, the motor-driven rotary type would undoubtedly be the first choice inasmuch as the piston type is much more susceptible to derangement and deterioration in this service.

The exhauster draws the air from the top of the interceptor shell, through what is termed the suction zone, this latter being designed to separate the dust from the air whereby objectionable dust entrainment in the air is eliminated.

The amount of vacuum which is required for operation of the Aro-Carrier system is dependent upon the material to be handled, its specific weight per cubic foot, and degree of fineness or coarseness, and the hourly capacity desired, as well as length, diameter, and life of the conduit. The exact amount is determined only after all of the factors are known and varies accordingly.

Air velocities are dependent upon the same factors which determine vacuum requirements and range from 4,000 ft. per minute upward. The minimum size conduit at present supplied with the Aro-Carrier is 3.75 in. internal diameter, although arrangements are being made for sizes down to 2 in. The maximum size at present is 8 in. internal diameter. The volume of air passing through the conduit depends upon diameter, vacuum and material to be handled.

This equipment can be used for the unloading of cars. A main conduit with suitable inlet openings to which a flexible steel suction hose can be attached can be installed parallel to the switch track and the material drawn from the cars through the suction hose in a manner similar to the operation of the commonly known vacuum cleaner.

Many other applications of the Aro-Carrier can be made such as trunk line with branches, as well as multiple lines. Installations are being made at present where material is drawn through an over-all distance of 500 ft., including a lift of 75 ft.

The apparatus just described is the most recent development in air conveying. It has features not found in other system, such as the use of an exhauster operated either by a steam jet or mechanically. It has been standardized in capacities of 5 to 50 tons per hour. Higher capacities may be attained by the installation of multiple units.

This system is suitable for conveying any granular material that will flow through a pipe without adhering to the walls of the conduit. Roofing gravel, coke, cement clinker, dolomite and phosphate rock are a few of the materials that may be handled in commercial quantities at low cost.

The Aro-Carrier cannot be used as a grader or classifier of material, viz., separating one size of material from another and delivering them separately. Its use is confined to the transfer of material.

The size of lumps which can be handled through this equipment is dependent upon the size of the pipe or conduit. The intake opening through which the material is fed into the conveyor is always made somewhat smaller than the actual diameter of the conduit itself and anything passing through this intake opening will be carried out through the conduit. Ordinarily the maximum size piece is 2 inches less than the diameter of the conduit.

The Trend of Future Developments

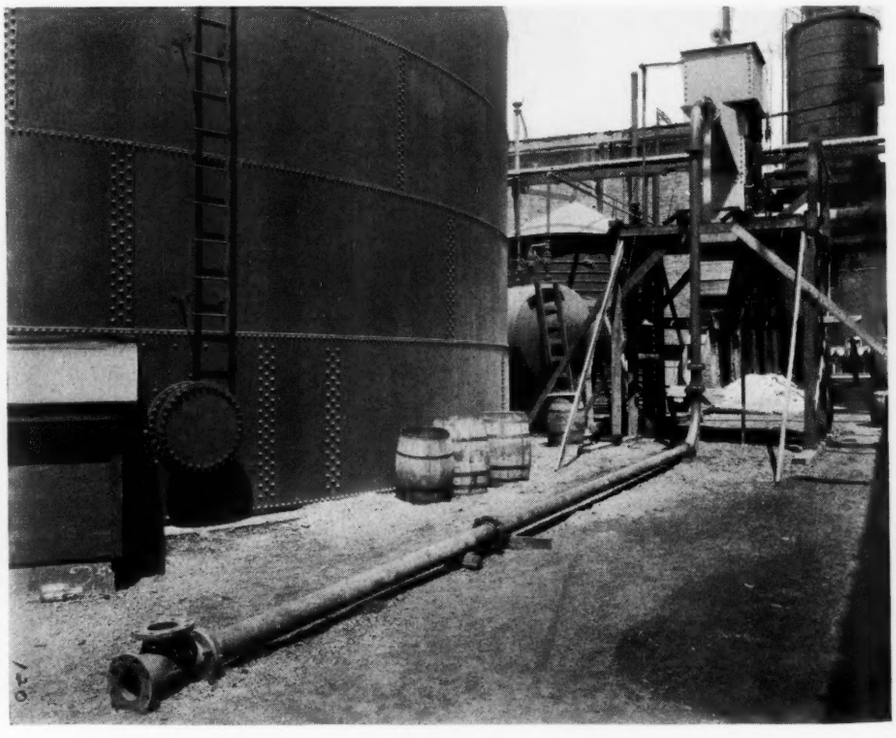
The preceding discussion perhaps will serve to identify new trends in handling equipment for various materials in different industries. Mechanical conveyors for handling the raw materials as well as finished cement, lime, gypsum, sand, etc., are well known, as are also their qualities and defects. To a lesser extent air conveyors are also known for handling dry and dusty materials. It has been shown that some types of these conveyors will handle materials containing small lumps as well as fines, and that others will handle only pulverized materials. It has also been indicated that certain types are suited for a limited class of operations.

In the cement industry it is evident that the abatement of the dust nuisance is properly recognized as a necessity both from the sanitary and economic standpoints. This reform is being accomplished at the cement plant of Ford Motor Co. by the Dust Recovering and Conveying Co. system and by the aerating and pumping method using the Fuller-Kinyon pump in the plants of the Lawrence Portland Cement Co. and the New Egyptian Portland Cement Co.

The simplification of equipment for unloading box cars, the reduction of supporting structures and building costs are also factors of the problem which indicate the adoption of pneumatic conveyors for such materials as sand, crushed lime, roofing gravel, etc. There is in addition the increasing use of by-products contained in many such materials which can be separated while conveyed. An example may be cited in the case of where a low vacuum system installed by the Guarantee Construction Co. of New York, is used to separate fine lime from the crushed lime. The latter is used for making slaked lime, and the former in the manufacture of sand lime brick.

A noticeable departure from lines of thought that were almost unchangeable fifteen years ago, is in connection with the power requirements of conveying equipment. One of the great objections to any type of fluid conveyor, was the excessive power required per ton of materials handled. Consideration of power costs alone showed such a variation between air and mechanical conveying that only where special conditions required it, was there a possibility for the installation of a pneumatic system.

However, today such things as dust losses, cleanliness, and sanitation are taken into account in arriving at the cost of handling. In this case it is found that the disparity is not so great as it was thought to be. An analysis by the new methods then leads to many heretofore unthought-of applications.



Feed end of conduit or pipe line leading to accumulator and control zone of a vacuum type conveyor installation

Portland Cement Output in December

Estimated Production and Shipments in 1926 Slightly Above 1925

PRODUCTION of portland cement in December, 1926, shows a slight increase and shipments show a decrease of 7%, as compared with December, 1925. Portland cement stocks at the end of 1926 were 11% higher than at the end of 1925.

The preliminary totals for 1926 show increases of over 1% in production and nearly 3% in shipments over the final totals for 1925.

These statistics, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are compiled from reports for December, 1926, received direct from all manufacturing plants except two, for which estimates were necessary on account of lack of returns.

Clinker Stocks

Stocks of clinker, or unground cement, at the mills at the end of December, 1926, amounted to about 7,645,000 bbl. compared with 5,748,000 bbl. (revised) at the beginning of the month.

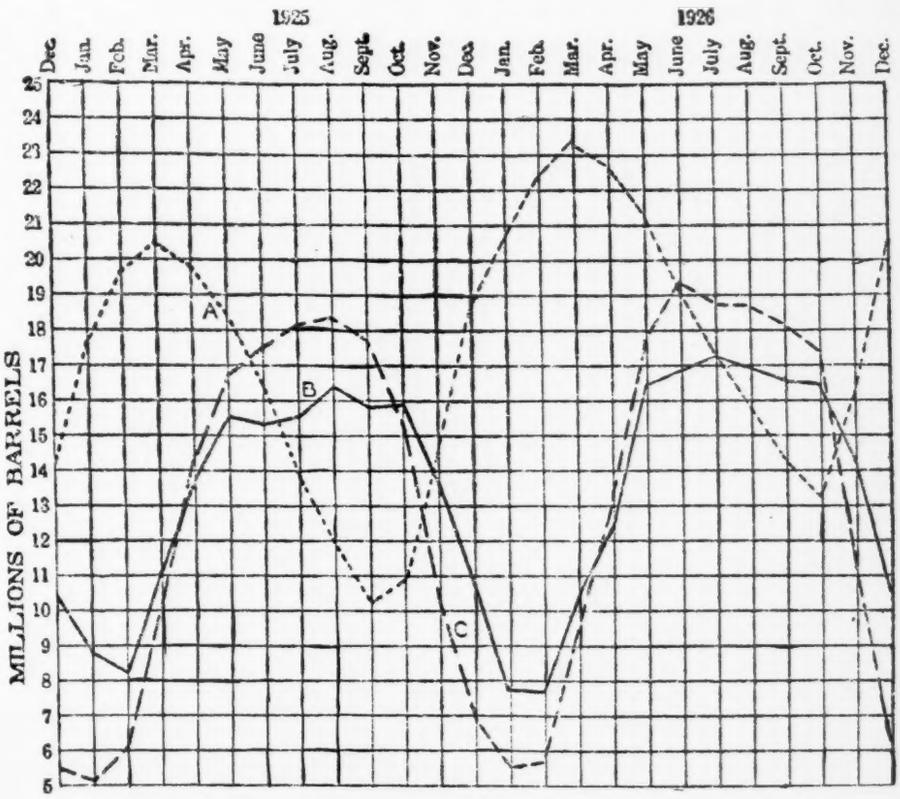
An estimate of the unground clinker by months is given below.

ESTIMATED CLINKER (UNGROUND CEMENT) AT THE MILLS AT END OF EACH MONTH, 1925 AND 1926

Month	1925	1926*
January	7,017,000	9,074,000
February	8,497,000	10,931,000
March	9,962,000	12,290,000
April	9,731,000	12,967,000
May	9,053,000	11,695,000
June	7,937,000	10,144,000
July	6,961,000	8,604,000
August	5,640,000	7,362,000
September	4,561,000	6,112,000
October	4,086,000	5,370,000
November	5,013,000	5,748,000
December	6,469,000	7,645,000

*Revised.

MONTHLY FLUCTUATIONS IN PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT


1925
1926
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
MILLIONS OF BARRELS
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5
A
B
C

(a) Stocks of finished portland cement at factories; (b) Production of finished portland cement; (c) Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during the months of October and November, 1925 and 1926:

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES, IN OCTOBER AND NOVEMBER, 1925 AND 1926, IN BARRELS*

Shipped to—	1925—Oct.	1926	1925—Nov.	1926
Alabama	158,310	169,086	161,142	134,009
Alaska	528	132	132	173
Arizona	33,577	44,360	36,310	27,412
Arkansas	52,339	70,785	43,423	79,627
California	1,125,094	1,276,210	972,874	887,351
Colorado	103,024	113,951	61,541	61,057
Connecticut	230,906	242,167	148,990	147,288
Delaware	63,752	44,898	24,504	17,682
District of Columbia	94,295	90,347	106,642	78,369
Florida	535,817	343,404	251,285	418,696
Georgia	134,198	148,699	104,559	161,710
Hawaii	8,086	16,887	8,410	21,417
Idaho	21,228	33,444	19,245	25,409
Illinois	1,257,184	1,918,899	817,588	776,758
Indiana	476,635	719,882	233,595	289,720
Iowa	259,971	501,683	96,762	116,116
Kansas	215,258	244,497	172,945	169,035
Kentucky	139,790	192,177	99,170	120,647
Louisiana	77,948	123,139	75,513	74,619
Maine	40,243	47,136	17,453	19,168
Maryland	196,739	270,241	140,656	212,972
Massachusetts	349,702	305,190	258,733	234,037
Michigan	992,423	1,159,596	537,713	702,901
Minnesota	376,854	384,739	168,138	87,777
Mississippi	41,777	68,149	53,244	61,685
Missouri	505,730	498,449	478,531	315,318
Montana	19,205	27,916	13,819	16,169
Nebraska	193,568	173,552	82,528	64,198
Nevada	10,048	7,955	5,751	4,751
New Hampshire	52,975	44,983	35,808	32,190
New Jersey	847,301	856,615	566,337	688,736
New Mexico	15,687	22,127	16,735	18,965
New York	1,880,822	2,107,119	1,249,902	1,584,352
North Carolina	328,705	382,736	200,447	276,568
North Dakota	28,020	30,647	9,531	8,969
Ohio	870,645	989,005	545,452	651,257
Oklahoma	212,696	188,144	226,437	225,767
Oregon	155,066	126,946	73,583	75,541
Pennsylvania	1,490,931	1,415,233	945,344	1,013,955
Porto Rico	0	0	577	7,250
Rhode Island	84,229	72,653	50,609	47,278
South Carolina	69,548	61,636	69,234	46,692
South Dakota	41,532	48,761	14,080	10,076
Tennessee	118,768	203,406	104,657	124,551
Texas	290,946	441,775	280,852	419,358
Utah	40,238	64,504	24,607	34,358
Vermont	31,509	34,591	9,301	14,455
Virginia	156,782	151,319	104,185	127,290
Washington	254,164	191,453	106,111	131,602
West Virginia	193,757	143,112	80,179	104,150
Wisconsin	285,712	582,919	173,988	169,068
Wyoming	16,522	15,475	9,403	8,160
Unspecified	36,326	13,132	29,247	54,253
	15,217,110	17,425,861	10,117,802	11,200,962
Foreign countries	91,890	60,139	69,198	75,038
Total shipped from cement plants	15,309,000	17,486,000	10,187,000	11,276,000

*Includes estimated distribution of shipments from three plants in October and November, 1925; and from five plants in October and November, 1926.

SUMMARY OF ESTIMATES OF PRODUCTION AND SHIPMENTS OF FINISHED PORTLAND CEMENT IN 1926, BY DISTRICTS

(In thousands of barrels)
(Revised January 10, 1927)

PRODUCTION

Commercial District	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1926	1925
Eastern Penn., N. J. and Md.	2,765	2,447	3,032	3,258	3,939	3,956	3,935	3,901	3,936	3,986	3,617	2,875	41,647	40,279
New York	623	288	374	517	861	890	911	936	948	999	820	634	8,801	8,770
Ohio, Western Penn. and W. Va.	523	739	626	1,248	1,825	1,665	1,851	1,824	1,797	1,795	1,157	851	15,901	15,573
Michigan	292	288	223	762	1,290	1,430	1,506	1,508	1,415	1,338	1,227	741	12,020	10,936
Wis., Ill., Ind. and Ky.	542	775	1,208	1,400	2,238	2,397	2,438	2,414	2,326	2,160	1,930	1,530	21,358	23,521
Va., Tenn., Ala. and Ga.	961	1,029	1,241	1,260	1,428	1,468	1,445	1,366	1,368	1,430	1,290	1,022	15,308	13,506
Eastern Mo., Iowa, Minn. and S. Dak.	435	483	744	1,134	1,518	1,545	1,576	1,561	1,470	1,458	1,310	904	14,138	14,572
Western Mo., Nebr., Kan. and Okla.	225	361	848	854	1,116	1,129	1,067	1,162	1,046	1,032	821	603	10,264	10,673
Texas	330	393	452	411	454	416	459	440	437	428	402	379	5,001	4,858
Colorado, Montana and Utah	48	70	142	240	273	311	312	309	247	275	200	87	2,514	2,299
California	1,034	743	1,259	1,009	1,233	1,281	1,302	1,248	1,272	1,381	1,154	981	13,897	13,098
Oregon and Washington	109	115	241	347	335	378	332	326	309	314	265	137	3,208	3,574
	7,887	7,731	10,390	12,440	16,510	16,866	17,134	16,995	16,571	16,596	14,193	10,744	164,057	161,659

SHIPMENTS

Commercial District	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1926	1925
Eastern Penn., N. J. and Md.	1,469	1,137	2,416	3,679	4,620	4,629	4,215	4,212	4,593	4,272	3,356	1,582	40,180	40,287
New York	205	145	335	660	928	1,081	1,146	1,086	1,194	921	609	233	8,543	8,534
Ohio, Western Penn. and W. Va.	382	402	679	1,195	1,921	2,051	2,053	1,897	1,903	1,668	1,067	543	15,761	14,629
Michigan	212	237	390	610	1,301	1,614	1,681	1,806	1,614	1,385	781	330	11,961	10,073
Wis., Ill., Ind. and Ky.	476	649	942	1,550	2,598	2,873	3,017	2,889	2,451	2,656	1,143	632	21,876	22,053
Va., Tenn., Ala. and Ga.	845	937	1,189	1,311	1,420	1,411	1,419	1,427	1,428	1,391	1,233	951	14,962	13,048
Eastern Mo., Iowa, Minn. and S. Dak.	281	396	724	1,142	1,777	1,946	1,756	1,720	1,556	1,842	602	284	14,026	14,478
Western Mo., Nebr., Kan. and Okla.	325	518	760	899	1,131	1,105	1,160	1,192	970	984	739	380	10,163	10,524
Texas	308	400	403	447	447	454	464	494	438	444	427	316	5,042	4,736
Colorado, Montana and Utah	73	106	191	225	256	289	269	297	288	252	142	69	2,457	2,263
California	984	765	1,264	958	1,259	1,305	1,276	1,258	1,318	1,359	972	978	13,696	13,109
Oregon and Washington	114	128	246	289	315	376	356	305	334	312	205	134	3,114	3,561
	5,674	5,820	9,539	12,965	17,973	19,134	18,812	18,583	18,087	17,486	11,276	6,432	161,781	157,295

SUMMARY OF ESTIMATES OF STOCKS OF PORTLAND CEMENT AT END OF EACH MONTH IN 1926, BY DISTRICTS

(In thousands of barrels)
(Revised January 10, 1927)

STOCKS OF FINISHED CEMENT

Commercial District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Eastern Penn., N. J. and Md.	3,805	5,115	5,732	5,311	4,629	3,967	3,687	3,375	2,718	2,437	2,697	3,990
New York	1,447	1,590	1,629	1,485	1,418	1,227	992	842	596	685	883	1,284
Ohio, Western Penn. and W. Va.	2,455	2,792	2,739	2,792	2,697	2,310	2,109	2,036	1,930	2,062	2,151	2,460
Michigan	1,994	1,947	1,780	1,931	1,915	1,734	1,558	1,261	1,062	1,025	1,486	1,897
Wis., Ill., Ind. and Ky.	3,574	3,700	3,966	3,816	3,455	2,980	2,400	1,925	1,792	1,296	2,084	2,982
Va., Tenn., Ala. and Ga.	966	1,058	1,111	1,059	1,068	1,125	1,150	1,089	1,029	1,067	1,124	1,195
Eastern Mo., Iowa, Minn. and S. Dak.	2,979	3,066	3,087	3,078	2,819	2,417	2,237	2,078	1,992	1,609	2,317	2,937
Western Mo., Nebr., Kans. and Okla.	1,556	1,399	1,487	1,443	1,430	1,454	1,362	1,331	1,407	1,455	1,538	1,761
Texas	502	488	536	501	515	478	472	418	417	406	381	444
Colorado, Montana and Utah	392	357	308	322	348	369	413	425	384	406	454	471
California	533	507	501	553	526	502	508	504	458	480	662	665
Oregon and Washington	379	366	360	419	435	437	413	434	403	406	466	469
	20,582	22,385	23,236	22,710	21,255	19,000	17,301	15,718	14,188	13,334	16,243	20,555

EXPORTS AND IMPORTS*

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES, IN NOVEMBER, 1926

Exported to—	Barrels	Value
Canada	1,053	$ 3,959
Central America	1,762	4,883
Cuba	7,890	18,708
Other West Indies	7,581	17,881
Mexico	12,018	34,119
South America	41,473	129,985
Other countries	4,821	28,568
	76,598	$238,103

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN NOVEMBER, 1926

Imported from	District into which Imported	Barrels	Value
Belgium	Galveston	2,997	$4,514
	Massachusetts	6,243	8,750
	New Orleans	28,268	38,704
	Philadelphia	8,394	12,194
	Total	45,902	$64,162
Canada	St. Lawrence	1,128	$1,860
Denmark and Faroe Islands.	Porto Rico	3,437	$7,400
France	New Orleans	(†)	$16
United Kingd'm	Los Angeles	1,025	$3,083
	New Orleans	500	1,213
	Porto Rico	2,127	3,143
	Washington	1,114	2,072
	Total	4,766	$9,511
	Grand total	55,233	$82,949

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1925 AND 1926

Month	Production 1925	Production 1926*	Shipments 1925	Shipments 1926*	Stocks at end of month 1925	Stocks at end of month 1926*
January	8,856,000	7,887,000	5,162,000	5,674,000	17,656,000	20,582,000
February	8,255,000	7,731,000	6,015,000	5,820,000	19,689,000	22,385,000
March	11,034,000	10,390,000	10,279,000	9,539,000	20,469,000	23,236,000
First quarter	28,145,000	26,008,000	21,456,000	21,033,000	.....	.....
April	13,807,000	12,440,000	14,394,000	12,965,000	19,877,000	22,710,000
May	15,503,000	16,510,000	16,735,000	17,973,000	18,440,000	21,255,000
June	15,387,000	16,866,000	17,501,000	19,134,000	16,409,000	19,000,000
Second quarter	44,697,000	45,816,000	48,630,000	50,072,000	.....	.....
July	15,641,000	17,134,000	18,131,000	18,812,000	13,896,000	17,301,000
August	16,419,000	16,995,000	18,383,000	18,583,000	11,952,000	15,718,000
September	15,939,000	16,571,000	17,711,000	18,087,000	10,247,000	14,188,000
Third quarter	47,999,000	50,700,000	54,225,000	55,482,000	.....	.....
October	15,992,000	16,596,000	15,309,000	17,486,000	10,979,000	13,334,000
November	13,656,000	14,193,000	10,187,000	11,276,000	14,534,000	16,243,000
December	10,713,000	10,744,000	6,917,000	6,432,000	18,515,000	20,555,000
Fourth quarter	40,361,000	41,533,000	32,413,000	35,194,000	.....	.....
Preliminary total	161,202,000	164,057,000	156,724,000	161,781,000	.....	.....
Amount of under estimate	457,000	.....	571,000	.....	.....	.....
Final total	161,659,000	.....	157,295,000	.....	.....	.....

*Revised.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1925 AND 1926

	Exports				Imports			
	1925		1926		1925		1926	
Month	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	71,596	$ 207,547	72,939	$216,431	231,258	$ 364,196	360,580	$576,717
February	56,249	181,356	73,975	220,706	119,077	206,308	314,118	527,948
March	65,248	200,410	69,080	205,647	218,048	337,039	493,241	812,968
April	89,508	263,831	96,296	284,772	197,686	280,826	257,302	398,114
May	85,385	250,845	78,601	224,365	186,897	286,959	223,130	337,031
June	71,343	217,899	80,684	248,814	254,937	409,539	335,570	495,744
July	98,141	286,543	130,822	370,220	335,118	499,602	250,862	395,981
August	103,961	289,904	64,946	216,489	379,847	611,551	350,638	560,532
September	102,649	285,225	70,920	239,174	513,252	789,121	194,129	308,224
October	73,369	228,467	69,389	225,874	535,050	824,268	263,403	386,335
November	101,825	294,201	76,598	238,103	388,604	678,518	55,233	82,949
December	100,323	296,900	.....	.....	295,543	526,001	.....	.....
	1,019,597	$3,003,128	.....	.....	3,655,317	$5,813,928	.....	.....

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO IN NOVEMBER, 1926*

	Barrels	Value
Alaska	701	$ 2,204
Hawaii	15,820	31,916
Porto Rico	8,700	20,949
	25,221	$55,069

*Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision. †Not recorded.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN DECEMBER, 1925 AND 1926, AND STOCKS IN NOVEMBER, 1926

Commercial district	Production 1925—Dec.—1926		Shipments 1925—Dec.—1926		Stocks at end of 1925—Dec.—1926		Stocks at end of November, 1926*
E'n Penn., N. J. & Md.	3,053,000	2,875,000	1,908,000	1,582,000	2,534,000	3,990,000	2,697,000
New York	710,000	634,000	352,000	233,000	1,028,000	1,284,000	883,000
Ohio, W'n Penn. & W. Va.	955,000	851,000	545,000	543,000	2,314,000	2,460,000	2,151,000
Michigan	904,000	741,000	309,000	330,000	1,923,000	1,897,000	1,486,000
Wis., Ill., Ind. & Ky.	1,257,000	1,530,000	632,000	632,000	3,510,000	2,982,000	2,084,000
Va., Tenn., Ala. & Ga.	942,000	1,022,000	813,000	951,000	949,000	1,195,000	1,124,000
E'n Mo., Ia., Minn. & S. Dak.	759,000	904,000	357,000	284,000	2,831,000	2,937,000	2,317,000
W'n Mo., Neb., Kan. & Okla.	512,000	603,000	438,000	380,000	1,657,000	1,761,000	1,538,000
Texas	393,000	379,000	342,000	316,000	479,000	444,000	381,000
Colo., Mont. & Utah	49,000	87,000	85,000	69,000	415,000	471,000	454,000
California	971,000	981,000	1,016,000	978,000	491,000	665,000	662,000
Ore. & Wash.	208,000	137,000	120,000	134,000	384,000	469,000	466,000
	10,713,000	10,744,000	6,917,000	6,432,000	18,515,000	20,555,000	16,243,000

*Revised.

Sales of Slate in 1926

THE value of the slate sold at the quarries of the United States in 1926 was $12,030,000, according to estimates furnished by producers to the Bureau of Mines, Department of Commerce. This was 4% less than the value reported for 1925. Slate reported sold for electrical, structural and sanitary and miscellaneous uses (chiefly flagstone) showed increase in both quantity and value, while the other products decreased.

The roofing slate sold amounted to 455,000 squares, valued at $4,832,000, a decrease of 8% in quantity and 5% in value. There was an increase of 34 cents in the average value per square.

The total sales of mill stock amounted to 9,831,000 sq. ft., valued at $4,084,000, a decrease of 11% in quantity and 3% in value.

Sales of structural slate—2,410,000 sq. ft., valued at $937,000—increased 3% in quantity and 9% in value. Sales of electrical slate, estimated at 1,872,000 sq. ft., valued at $1,565,000, increased 13% in quantity and 14% in value.

Sales of mill stock for blackboards which was the only variety of mill product that showed increased sales in 1925 decreased 27% in quantity and 23% in value in 1926. The estimated output was 3,760,000 sq. ft., valued at $1,298,000.

The sales of crushed slate for roofing granules and flour in 1926 was estimated at 495,700 short tons, valued at $3,034,000, which was practically the same quantity as in 1925. The average value per ton was somewhat lower than in 1925.

The accompanying table compares the estimated sales of slate by quarrymen in 1926, by uses, with the sales in 1925.

ROOFING SLATE, MILL STOCK* AND SLATE GRANULES SOLD IN THE UNITED STATES IN 1925 AND 1926, BY USES

Use	1925 Quantity	1925 Value†	1926 (Estimated) Quantity	1926 (Estimated) Value†
Roofing squares	494,530	$5,084,945	455,000	$4,832,000
Approximate short tons	166,000		153,000	
Electrical sq. ft.	1,655,810	1,376,948	1,872,000	1,565,000
Approximate short tons	11,900		13,500	
Structural and sanitary sq. ft.	2,332,700	862,019	2,410,000	937,000
Approximate short tons	16,700		17,300	
Grave vaults and covers sq. ft.	523,850	125,582	470,000	124,000
Approximate short tons	7,500		6,700	
Blackboards and bulletin boards sq. ft.	5,184,060	1,690,612	3,760,000	1,298,000
Approximate short tons	13,900		10,000	
Billard-table tops sq. ft.	341,440	140,498	330,000	128,000
Approximate short tons	2,500		2,400	
School slates pieces	1,944,320	35,818	1,850,000	32,000
Approximate square feet	1,040,000		989,000	
Approximate short tons	1,400		1,300	
Granules short tons	497,700	3,210,904	495,700	3,034,000
Other short tons (estimated)	7,000	48,000	10,000	76,000
Total (quantities approximate, in short tons)	724,600	$12,575,326	710,000	$12,026,000

*In 1925 the mill stock sold, including school slates, was 11,077,860 sq. ft., valued at $4,231,477; in 1926, 9,831,000 sq. ft., valued at $4,084,000. †F.o.b. at point of shipment.

Lime in 1925

THE Department of Commerce announces that, according to data collected at the biennial census of manufactures taken in 1926, the establishments engaged primarily in the production of lime reported, for 1925, a total output valued at $50,651,748, an increase of 7.2% as compared with $47,243,756 for 1923, the last preceding census year.

Of the total for 1925, $26,310,529 was contributed by quicklime, $15,539,371 by hydrated lime, $4,724,653 by limestone sold as such, and $4,077,195 by other products (including agricultural limestone, road material, lime marl, lime putty, poultry grit, plaster, insecticides, screenings, etc.).

Of the 282 establishments reporting for 1925, 8 were located in Alabama, 3 in Arkansas, 9 in California, 6 in Connecticut, 9 in Illinois, 6 in Indiana, 8 in Maryland, 10 in Massachusetts, 8 in Michigan, 14 in Missouri, 13 in New York, 17 in Ohio, 46 in Pennsylvania, 11 in Tennessee, 6 in Texas, 9 in Vermont, 28 in Virginia, 5 in Washington, 8 in West Virginia, 23 in Wisconsin, and the remaining 35 in 18 other states. In 1923 the industry was represented by 301 establishments, the decrease to 282 in 1925 being the net result of a loss of 21 establishments and a gain of 2. Of the 21 establishments lost to the industry, 11 had gone out of business prior to the beginning of 1925, 6 were idle, and 4 reported products valued at less than $5,000. (No data are tabulated at the biennial censuses for establishments with products under $5,000 in value.)

The statistics for 1925, as presented herewith, are preliminary and subject to such correction as may be found necessary upon further examination of the returns.

SUMMARY FOR THE LIME INDUSTRY: 1925 and 1923

	1925	1923	Per cent of inc. or dec.
Number of establishments	282	301	— 6.3
Wage earners (average number)*	12,072	12,290	— 1.8
Maximum month	Aug. 12,792	Aug. 13,341	.....
Minimum month	Jan. 10,679	Jan. 10,604	.....
Per cent of maximum	83.5	79.5	.....
Wages†	$13,977,128	$13,522,069	+ 3.4
Cost of materials (including fuel and electric power)†	$20,013,768	$19,700,191	+ 1.6
Products, total value†	$50,651,748	$47,243,756	+ 7.2
Quicklime	$26,310,529	$25,693,305	+ 2.4
Hydrated lime	$15,539,371	$13,851,455	+12.2
Limestone, sold as such	$ 4,724,653	$ 3,515,631	+34.4
Other products	$ 4,077,195	$ 4,183,365	— 2.5
Value added by manufacture‡	$30,637,980	$27,543,565	+11.2
Horsepower	77,645	74,205	+ 4.6

*Not including salaried employes.
†The amount of manufacturers' profits cannot be calculated from the census figures, for the reason that no data are collected in regard to a number of items of expense, such as interest, rent, depreciation, taxes, insurance, and advertising.
‡Value of products less cost of materials.

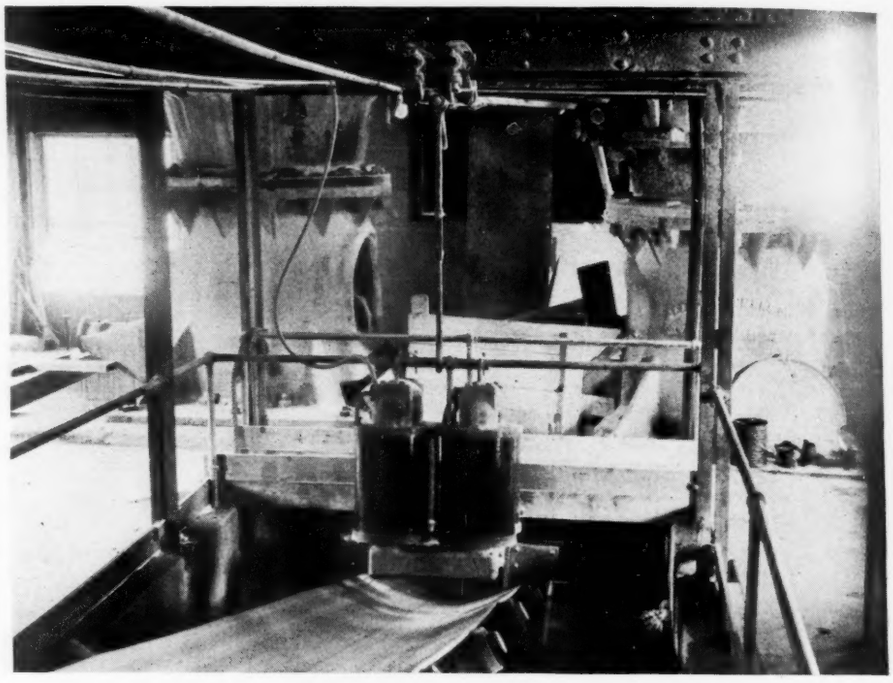
Texas Shell Deposits Purchased for New Cement Plant

PRELIMINARY to starting construction of a cement manufacturing plant to cost $5,000,000, the Western Development Co. of California has purchased three large oyster shall banks, located in Aransas, Mesquite and Copano bays on the Gulf coast of Texas, according to T. E. Hubby, state fish and oyster commissioner, who made the sale to the company. Extensive investigation of the extent of the oyster shell deposits was made by representatives of the Western Development Co. and it was found that the supply is sufficient for an extended period of operation. The manufacture of cement from oyster shells, commonly known as mud-shells, is already being carried on extensively by the Texas Portland Cement Co., which has operated a plant at Houston for several years. The Texas Portland is a subsidiary of the International Cement Corp., New York, N. Y.

Hints and Helps for Superintendents

Electro-Magnet for Removing Tramp Iron from Stone

MANY quarry operators have been troubled with tramp iron passing along with the crushed stone to the screen. If not removed before, the iron, usually in the form of bolts, etc., may seriously damage the screen. To overcome this nuisance, the American Lime and Stone Co. has installed an electro-magnet, as illustrated, at the Bellefonte, Penn., plant. The magnet is placed immediately above the conveyor belt leading from the crusher to the screening plant. The illustration shows its position and the nails and bolts clinging to the magnet testify to the efficient removal of the damaging iron from the crushed stone.

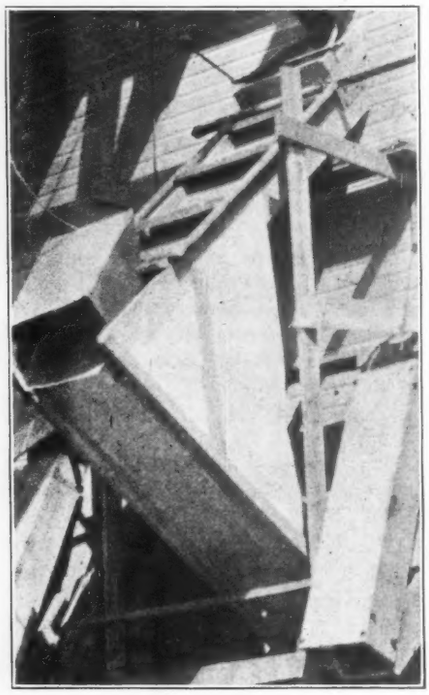


Electro-magnet placed over conveyor belt to remove tramp iron

Neat Design of Washing Chute

WASHING stone as it flows down a chute to be loaded into railway cars is now becoming a common practice and a number of designs of chutes for washing have been published from time to time in the pages of this department. The washing chute shown here is perhaps as neat and effective as any that has been noted.

It consists of a simple chute with a heavy wire screen bottom over which the stone flows on the way to the car. Above the chute are three cross pipes with spray holes which are connected to a header pipe furnished with pressure water. Although the stone passes very quickly under the spray pipes, the washing is effective.



Washing chute of simple design

The purpose of this device was to wash stone dust from crushed stone. It was necessary to reduce the dust from nearly 4% to less than 1%. Tests from several samples showed that the dust was always less than 1%, averaging about 0.6%, so the washing was all that could be asked for.

It is worth noting that the space below the screen is boxed in to keep water from flying about and that there is a hood over the end of the chute to keep stones from "jumping."

The Life of a Conveyor Belt

EVERY engineer in an up-to-date industrial plant where conveyors and elevators are in use is confronted at one time or another with problems concerning their installation, operation and maintenance. Troubles occur which the engineer must eliminate if production is to be maintained. Probably the most annoying of these is concerned with the belt. He is interested in a long life for the belt and is quite disturbed if a belt goes wrong. Sometimes the manufacturer is at fault, but more frequently it is the fault of the user. Mr. Frederick Hetzel, in the new second edition of his book, "Belt Conveyors and Belt Elevators," after thirty years' experience with belts and conveyors, has drawn up a list of thirty items outlining the factors which reduce the life of a belt. These are:

Buying a cheap belt—poor grade of rubber or light-weight fabric.

Buying an old belt—rubber dried out, no elasticity.

Injury to belt by carelessness in getting it into place on the conveyor—cover or edges torn.

Splice not square with the belt—belt runs crooked, wears edges.

Material too hot—burns holes in the belt, chars the cotton.

Material corrodes cotton or softens rubber—plies come apart.

Loading chute of poor design—material wears the belt surface.

Skirt-boards too long or badly set—belt cut.

Loading belt directly over idler—belt cut.

Speed too fast for proper pick-up of lumps—belt cut or abraded.

Speed so fast that belt carries only thin load—belt wears out in center.

Cover too light for sharp lump material—belt cut, cover worn.

Handling wet, sharp material through a tripper—cover cut and worn.

Pulleys too small at drive, take-up, bend, snub or tripper—plies come apart.

Wide gaps between idler pulleys—belt cracks longitudinally.

Using belt too thick or too stiff to lie down on horizontal pulleys or idlers—belt runs crooked, edges wear off.

Bad alignment of conveyor—edges rubbed off, or worn against side guide idlers.

Too many side-guide idlers—wear off edges of belt.

Too many fixed trippers—belt injured by reverse bending and by putting material back on belt.

Excessive take-up tension—belt stretches and splices pull out.

Reverse bends in belts—plies come apart, wear on pulley rims and belt surface.

Exposure to snow, rain, sunlight—rubber decays.

Lubrication neglected—belts cut and torn by worn idlers.

Frequent starting under full load—belt stretches and splices pull out. Slip injures belt surface.

Discharge chute choking—material catches on belt and tears it.

Idler pulleys broken—belt tears.

No decking used—lumps fall on return belt, jam under foot pulley and tear the belt.

Oil or grease dropping on belt—rubber softens and becomes loose.

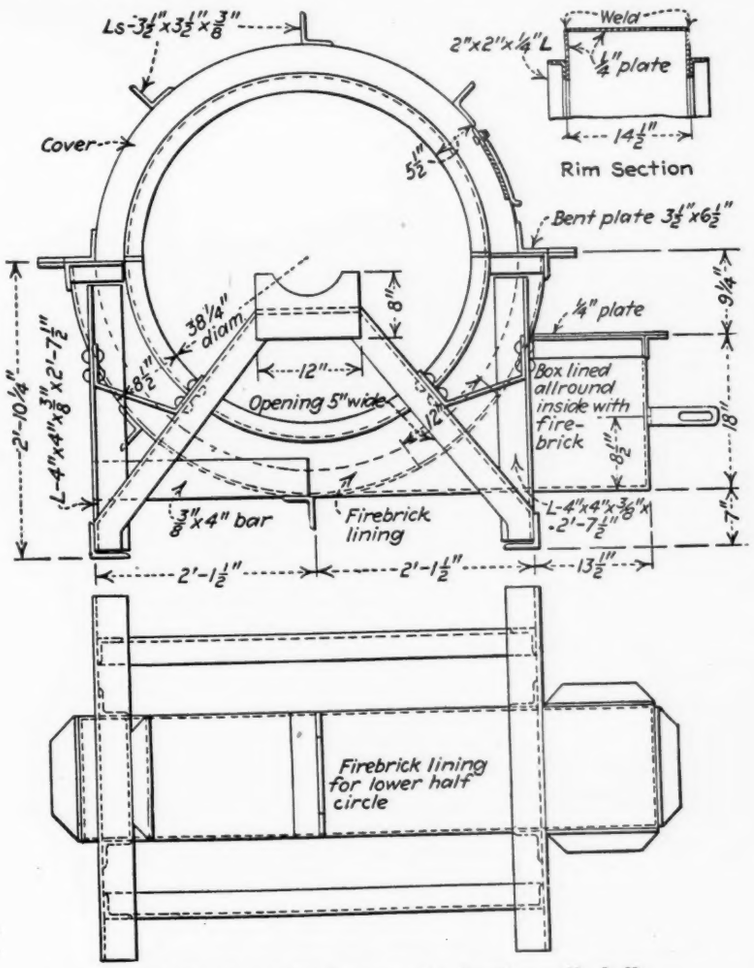
Pulley lagging rough or worn—bolts project, tear the belt.

Using wrong belt to handle moist, soluble substances (sugar, salt, chemicals)—liquid gets into fabric, crystallizes there, stiffens belt, plies comes apart. Service requires balata belt or good rubber covers.

Improvised furnace for melting scrap metals about a quarry

A Quarry Brass Foundry

WILLIAM POWELL, assistant general superintendent of the Fairmount quarry of the Illinois Steel Co., has devised an improvised furnace for melting scrap brass, which is then molded and used in repairing the brass in car journals, around locomotives, a little around the steam shovels, etc. This is simply a hole 20 in. deep, lined with a bottom and sides of fire brick, the diameter being 30 in. A pipe leads compressed air to the bottom of this furnace, so that when the coke is lighted it can be forced to a quick heat. The practice is to fill this hole heaping full of coke, and to set a crucible filled with scrap brass just on top. When the metal is melted, the crucible is lifted out with a pair of improvised tongs, set into a small carrier ring such as those used in foundries, and poured into molds. The view shows the crucible, tongs, and carrier ring used in this process. The articles made in this way are not perfect, because the brass employed is not sorted into perfect metal, but it solves many little problems and often prevents inconveniences of delay in getting new parts.



Details of special furnace for heating roll shells

Roll Shell Heating Device

AT the Garfield mills of the Utah Copper Co. worn roll shells are stripped by cutting with an oxy-acetylene torch. New shells are placed upon the rolls and are heated in a special oil-fired furnace which receives its oil supply from a portable pressure tank, compressed air being used for the operation of the burner.

The furnace which was first used at the Alaska Gastineau mill was introduced into the Arthur plant by Roy Hatch, the present superintendent. It is in two parts. The lower part contains the burner and combustion chamber and the upper part is removable. The lower part is provided with an angle-iron frame to support the projecting ends of the shaft, and is lined with firebrick. In operation, the roll is picked up in a sling and placed in the lower part of the furnace. The burner is started and the cover placed in position. More than half an hour is required to heat the shell when the top part of the furnace is removed by the crane and the roll lifted out and set on floor jacks, the follower plates of the roll being set in position by a battering ram when they are bolted up. About an hour or less is required to set a new roll shell in place. The accompanying illustration shows the design of the fnrnace.—*Engineering and Mining Journal-Press.*

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Alpha Portland Cement Co. (common)[2] new stock	Jan. 14	No par	42	44	75c Jan. 15
Alpha Portland Cement Co. (preferred)[2]	Jan. 14	100	115	.....	1¾% quar. Mar. 1
Arundel Corporation (sand and gravel—new stock)	Jan. 17	No par	32	32	45c qu., 20c ex. Jan. 3
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	Jan. 19	.....	109½	112	
Atlas Portland Cement Co. (common)[2]	Jan. 17	No par	41	43	50c qu. Dec. 1, $1 ex. Jan. 12
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% quar. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	Jan. 17	33⅓	43	.....	2% quar. Jan. 3
Beaver Portland Cement Co. (1st Mort. 7's)[8]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (common)[4]	Dec. 17	100	135	.....	1½% qu.; $4 ex. Dec. 31
Bessemer Limestone and Cement Co. (preferred)[4]	Jan. 13	100	108	109½	1¾% quar. Dec. 31
Bessemer Limestone and Cement Co. (convertible 8% notes)[4]	Dec. 17	100	99	100	8% annual
Boston Sand and Gravel Co. (common)	Jan. 15	100	73	75	1% qu., 2% ex. Jan. 1
Boston Sand and Gravel Co. (preferred)	Jan. 15	.....	.....	85	1¾% quar. Jan. 1
Boston Sand and Gravel Co. (1st preferred)	Jan. 15	.....	.....	90	2% quar. Jan. 1
Canada Cement Co., Ltd. (common)	Jan. 17	100	131	.....	2% Jan. 4
Canada Cement Co., Ltd. (preferred)[11]	Jan. 12	100	118	119	1¾% quar. Jan. 4
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	Jan. 12	.....	101½	102½	J% semi-annual A&O
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	Jan. 12	100	93	96	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Jan. 15	No par	22½	.....	75c Jan. 12
Charles Warner Co. (preferred)	Jan. 15	100	100	104	1¾% quar. Jan. 27
Charles Warner Co. (lime, crushed stone, sand and gravel) 7s, 1929[18]	Jan. 12	100	102½	103½	
Cleveland Stone Co. (new stock)	Jan. 17	.....	48½	50	50c qu.; 25c ex. Dec. 15
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	Jan. 13	100	104	.....	
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Jan. 18	100	95	99	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Jan. 18	100	95	100	
Consumers Rock and Gravel Co. (1st Mort. 7s)[18]	Jan. 13	100	99½	101½	
Dewey Portland Cement Co. (1st mort. 6's 1942)[30]	Jan. 18	100	97	100	
Dolese and Shepard Co. (crushed stone)[7]	Jan. 17	50	93	95	$1.50 Jan. 1, $1.50 ex. Jan. 1
Egyptian Portland Cement Co. (7% pfd. with com. stock purchase warrants)[21]	Dec. 31	.....	95	100	1¾% quar. Oct. 1
Egyptian Portland Cement Co. (common)[21]	Dec. 31	.....	8½	10	40c quar. Oct. 1
Giant Portland Cement Co. (common)[2]	Jan. 17	50	90	100	
Giant Portland Cement Co. (preferred)[25]	Jan. 17	50	45	50	3½% and 19% ex. Dec. 15
Ideal Cement Co. (common)	Jan. 17	No par	70	72	$1 quar., $1 ex. Dec. 15
Ideal Cement Co. (preferred)[6]	Dec. 18	100	105	108	1¾% quar. Dec. 15
International Cement Corporation (common)	Jan. 17	No par	48⅜	49⅜	$1 quar. Dec. 31
International Cement Corporation (preferred)[2]	Jan. 15	100	104	104½	1¾% quar. Dec. 31
Kelley Island Lime and Transport Co.	Jan. 17	100	133	135	$2 quar., $2 ex. Jan. 2
Lawrence Portland Cement Co.[2]	Jan. 14	100	90	100	2% quar.
Lehigh Portland Cement Co.[6]	Jan. 17	50	94	97	1½% quar.
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1927 to 1931)[13]	Dec. 18	100	98	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1931 to 1935)[13]	Dec. 18	100	97	98½	
Marblehead Lime Co. (1st Mort. 7's)[14]	Jan. 13	100	100	.....	
Marblehead Lime Co. (5½% notes)[14]	Jan. 13	100	98	100	
Michigan Limestone and Chemical Co. (common)[6]	Jan. 17	.....	26	.....	
Michigan Limestone and Chemical Co. (preferred)[6]	Jan. 17	.....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Jan. 17	25	51	52	50c Dec. 15
Monolith Portland Cement Co. (common)[9]	Jan. 13	.....	11¾	12½	8% ann. Jan. 2
Monolith Portland Cement Co. (units)[9]	Jan. 13	.....	29¼	30½	
Monolith Portland Cement Co. (preferred)[9]	Jan. 13	.....	8¾	9	
Nazareth Cement Co.[26]	Jan. 12	No par	37	38½	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	Jan. 13	.....	118	.....	
New England Lime Co. (Series A, preferred)[16]	Jan. 13	100	.....	95	
New England Lime Co. (Series B, preferred)[22]	Jan. 18	100	94	.....	
New England Lime Co. (V.T.C.)[22]	Jan. 13	.....	35	38	
New England Lime Co. (6s, 1935)[24]	Dec. 31	100	99	101	
North American Cement Corp. 6½s 1940 (with warrants)	Jan. 15	100	93½	95	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	Aug. 14	.....	94	99	2 mo. period at rate of 7%
North American Cement Corp. (common)[19]	Nov. 8	.....	20	22	
North American Cement Corp. (preferred)	Jan. 10	.....	.....	.....	1.75 quar. Feb. 1
North Shore Material Co. (1st Mort. 6's)[15]	Jan. 19	100	98	100	
Pacific Portland Cement Co., Consolidated[5]	Jan. 14	100	60¼	62	25c mo.
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[5]	Jan. 14	100	96¾	.....	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	Jan. 13	10	5¾	6⅛	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[29]	Jan. 15	100	99¾	100½	
Pennsylvania-Dixie Cement Corp. (preferred)[28]	Jan. 5	100	99½	99½	1¾% Dec. 15
Pennsylvania-Dixie Cement Corp. (common)[28]	Jan. 17	.....	38⅜	39	80c Jan. 1
Petoskey Portland Cement Co.[1]	Jan. 17	10	9½	10	1½% quar.
Pittsfield Lime and Stone Co.[31]	Jan. 14	.....	.....	100	
Pittsfield Lime and Stone Co.[31] (common)	Jan. 14	.....	.....	25	
Rockland and Rockport Lime Corp. (1st preferred)[10]	Jan. 13	100	105	105	3½% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (2nd preferred)[10]	Jan. 13	100	60	.....	3% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (common)[10]	Jan. 13	No par	50	55	1½% quar. Nov. 2
Sandusky Cement Co. (common)[1]	Jan. 17	100	125	.....	$2 qu., $4 ex. Jan. 1
Santa Cruz Portland Cement Co. (bonds)[5]	Jan. 14	.....	106	110	6% annual
Santa Cruz Portland Cement Co. (common)[5]	Jan. 14	.....	.....	80	$1 quar., $1 ex. Jan. 1
Schumacher Wallboard Corp. (common)	Jan. 14	.....	23⅝	23¾	
Schumacher Wallboard Corp. (preferred)	Jan. 14	.....	27	.....	
Superior Portland Cement, Inc. (Class A)[20]	Jan. 13	.....	45	45½	
Superior Portland Cement, Inc. (Class B)[20]	Jan. 13	.....	22	23	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	Jan. 12	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	Jan. 12	100	98	100	
United States Gypsum Co. (common)	Jan. 17	20	103	103¾	2% quar., $1.40 and 35% stk. ex. Dec. 31
United States Gypsum Co. (preferred)	Jan. 17	100	115¾	116	1¾% quar. Dec. 31
Universal Gypsum Co. (common)[3]	Jan. 19	No par	7	8	
Universal Gypsum V.T.C.[3]	Jan. 19	No par	6½	7½	
Universal Gypsum Co. (preferred)[3]	Nov. 23	.....	73	77	1¾% quar. Sept. 15
Universal Gypsum and Lime Co. (1st 6's, 1946)[3]	Jan. 19	100	.....	96	
Union Rock Co. (7% serial gold bonds)[18]	Jan. 13	100	99	101	
Wisconsin Lime and Cement Co. (1st Mort. 6s, 1940)[18]	Jan. 19	100	98	100	
Wolverine Portland Cement Co.	Jan. 17	10	5½	7	3% Nov. 15

[1]Quotations by Watling, Lerchen & Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee, Higginson & Co., Boston and Chicago. [11]Nesbitt, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson Jr. Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]William C. Simons, Inc., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [30]McIntyre & Co., New York, N. Y.

QUOTATIONS ON INACTIVE ROCK PRODUCTS CORPORATION SECURITIES ON PAGE 58

Editorial Comment

"Reverting again to the road contractor producer's interest in the findings, attention may be drawn to one conclusion of particular interest. It is: That a relatively small quarry can be operated with direct costs lower than the average of large-scale quarries if good operating intelligence and modern power and equipment are employed."—From an editorial in *Engineering News-Record.*

Costs in Small Quarries

The above is one of those half-truths, belief in which has cost some people a lot of money—especially those road contractors who have attempted to produce their own road stone. It is true that *some* small quarries have lower costs than *some* large quarries. There are hand-operated quarries in the Southern States, employing labor at 20c an hour, which have very low costs for that kind of an operation. But if the same quarries were near large industrial centers, where wages are four times as much, and where men will not go into a quarry to drill and load stone by hand if they can find easier work, such quarries would go broke in a week, if they used the same methods and equipment.

The wise road contractor has very little interest in opening a quarry and producing his own stone, because he knows that it costs from 25 to 100% of his original investment in plant and equipment to open and develop a quarry face that can be worked with anywhere near the same efficiency as that of existing plants. And this investment in developing a quarry face is a permanent investment, which he must leave behind him when his road job is done.

There probably is not a great deal of difference in direct costs between relatively small quarry operations of say 500 tons per day, and large operations of 5000 tons per day, if each is equipped with modern machinery and intelligently and efficiently managed. This is obvious to most every experienced quarry operator, and is well-known throughout the commercial quarry industry. Theoretically, the large quarry operation should have less overhead; actually it is questionable if it does, because it has many extra costs, for sales offices, etc., the smaller operation does not have.

Incidentally, the quarry costs referred to, which were gathered and compiled by the United States Bureau of Public Roads, are of more academic interest, because of their source, than of any practical value. We have seldom known of an instance where quarry operators have made public their actual costs, and when dealing with government officials, no matter from what particular bureau, it is quite customary for all business men to be rather chary of giving out actual costs. And, furthermore, it must be acknowledged by any one at all familiar with the present state of the quarry industry, that a great many operators do not know what it actually costs them to get out stone on a 12-month year operating basis, and, more than that, a good many, particularly among the smaller producers, do not *know how* to compute their costs on a basis fair either to themselves or to the industry. There are a great many cost items the small producer overlooks because he does not have to account to a critical board of directors, that the larger producer has learned from bitter experience are there.

We reprinted the U. S. Bureau of Public Roads cost figures, complete, in our issue of November 13, 1926, without comment, knowing they would be of interest to commercial crushed-stone producers, because of their origin, but not with any expectation that they would be taken so seriously as to induce anyone to go into the crushed stone business.

Rock Products and Country Life

Looking over the sand and gravel and crushed stone industries, one is struck by the number of plants that are being built in comparatively small places, as well as the enterprises already carried on in such places. One might know that this is so from the fact that the average haul in such materials is more than 50 miles, and the main markets are in the larger cities. Even the short hauls are often from one point in the country to another, to supply material for modern highways.

These rock products industries have done much to bring new life to towns that were declining as their importance as trading centers diminished. This has not been generally appreciated, as those who write on national economics hardly recognize that such industries exist. But a production running well over 300,000,000 tons annually can hardly be ignored and the prospects are that this tonnage will continue to increase.

The effect of good roads in bringing money from the city to the country through tourist traffic is now fairly well understood. The amount brought in by rock products industries (largely road materials) is much less, but it is just as important to those who earn it. The two together are helping to solve one of the most vexing problems of our modern industrial life, which is to provide channels through which the profits that tend to accumulate in cities may flow back to the countryside, to be spent for other things than the merely necessary food and raw materials. Without such channels there is the danger of creating a new sort of peasantry in the place of an independent and self-respecting citizenry.

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend rate
Atlanta Shope Brick and Tile Co.[1]	Nov. 24	.....	25c	.....	
Benedict Stone Corp. (cast-stone) (50 sh. pfd. and 390 sh. com.)[1]	Dec. 29	.....	$400 for the lot	.....	
Coplay Cement Mfg. Co. (common) (1)	Dec. 10	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred) (1)	Dec. 30	.....	70	.....	
Eastern Brick Corp. 7% cu. pfd.) (1)	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common) (1)	Dec. 9	10	40c	.....	
Edison Portland Cement Co. (common)[4]	Sept. 11	50	20c	.....	
Edison Portland Cement Co. (preferred)	Nov. 3	50	17½c(x)	.....	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Globe Phospate Co. ($10,000 1st mtg. bonds, $169.80 per $1000 paid on prin.)	Dec. 22	.....	$50 for the lot	.....	
Iroquois Sand & Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.) (1)	Mar. 17	.....	$12 for the lot	.....	
Limestone Products Corp. (150 sh. pfd., $50 par, and 150 sh. com., no par)	Dec. 22	.....	$60 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼% semi-annual
Olympic Portland Cement Co. (g)	Oct. 13	.....	.....	£1⅝	
Phosphate Mining Co. (1)	Nov. 24	.....	1	.....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.) (1)	June 23	.....	$200 for the lot		
Rockport Granite Co. (1st 6's, 1934)[2]	Aug. 31	.....	90	.....	
Simbroco Stone Co. (pfd.)	Dec. 12	.....	.....	.....	$2 Jan. 1
Southern Phosphate Corp.[6]	Sept. 15	.....	1¼	.....	
Tidewater Portland Cement Co. (3000 sh. com.)	Dec. 22	.....	$6525 for the lot	.....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd. (6)	Nov. 3	.....	$1 for the lot	.....	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick) (1)	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. (1) Price obtained at auction by Adrian H. Muller & Sons, New York. (2) Price obtained at auction by R. L. Day and Co., Boston. (3) Price obtained at auction by Weilepp-Bruton and Co., Baltimore, Md. (4) Price obtained at auction by Barnes and Lofland, Philadelphia, Pa. (5) Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. (6) Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

Associated Gravel Company Bonds Offered

HUNTER, DULIN AND CO., Schwabacher and Co., Oakland, Calif., are offering at 98 and accrued interest to yield 6.80%, $450,000 first mortgage (closed) 6½% sinking fund gold bonds of the Associated Gravel Co., Stockton, Calif.

The following data while not authenticated is taken from sources deemed to be reliable:

Properties. The new company merges all the properties and assets of the Niles Sand, Gravel and Rock Co., River Rock Gravel Co., Riverbank Sand Co. and the Coyote Gravel Co. The company will own and operate two modern sand and gravel plants at Niles, Alameda county, and Tracy, San Joaquin county, together with a modern sand plant at Riverbank, on the Santislaus river. Plans are under way for the erection of an additional plant on the properties of the Coyote company, in the heart of the Santa Clara valley.

Security and Assets. This issue of bonds will be a direct obligation of the Associated Gravel Co. and will be secured by a first mortgage or deed of trust on all the real property, leaseholds and improvements to be acquired by the company which is appraised at $822,756. This amount will be increased by $150,000, which will also be pledged as security, upon completion of the plant of the Coyote Gravel Co.

Sinking Fund. The issue is dated August 1, 1926, and matures August 1, 1936. Provision is made for a sinking fund of 15% of net earnings for the first year, 20% the second year, 25% the third year, 40% the fourth year and 50% for all succeeding years while any of these bonds are outstanding. On the basis of past earnings alone, the sinking fund is expected to retire the entire issue in about eight years.

Earnings. Net earnings of the consolidated companies, after depreciation, depletion and other charges, but before federal taxes, for the three years ended December 31, 1925, have averaged $149,238 annually, equivalent to more than five times the maximum annual interest charges of this bond issue. Estimated earnings for 1926 are reported to compare favorably with those of the past three years, and upon completion of the Coyote plant net earnings are expected to be increased by at least $50,000 annually.

Distribution. Materials produced by the consolidated companies are sold through dealers in practically every important community in central California. The importance of the new company is illustrated by the fact that the component companies supplied materials used in construction of the Standard Oil, Hunter-Dulin, Matson, Pacific Gas and Electric, Southern Pacific, Civic Auditorium and Public Library buildings and the Twin Peaks tunnel.

Arundel Corporation Extras

AN extra dividend of 20 cents per share on the common stock (no par value) in addition to the regular quarterly dividend of 45 cents per share, both payable on January 3, were declared by the directors of the company. This brings total disbursements on the common stock for the year 1926 to $2 per share per annum, compared with a total of $1.80 for 1925.

Net income for November, after depreciation, amounted to $200,442, and for the 11 months ended November 30, $1,946,375.

Sewell L. Avery Advocates Caution in Building Projects

SEWELL L. AVERY, president of the United States Gypsum Co., Chicago, in a recent statement published in the Chicago *Tribune*, advocated a cautious attitude toward the immediate future of the building industry. "We are preparing for a recession in building during the current year," Mr. Avery said. "It is inevitable that the huge amount of construction the country has accomplished in the last few years must soon have taken up all the slack, and although I cannot foresee when this will occur, I believe the adoption of a cautious attitude will offset any great effect a sudden recession will have upon the country in general. Overproduction of construction materials soon would be reflected in price-cutting and diminishing profits to the producers."

U. S. Gypsum earnings, according to Mr. Avery, will approximate those reported in 1925. The first half of the current year, Mr. Avery added, should result in profits about the same as were reported in the first half of the previous year. Net income in 1925 was $8,414,117 after depreciation, depletion, federal taxes and other charges, equal after preferred dividends to $15.45 a share of $20 par on $10,138,300 common.

Canada Cement Common Strong

THE past few weeks have seen a strong demand for Canada Cement Co. common stock, which has caused the price to mount from about 112 on November 9, 1926, to 131 on January 17. As is usual in such cases, various stories to account for the buying have been circulated, among them being a rumor that interests associated with the National Cement Co. were endeavoring to get control. Inquiries by *The Financial Times* (Canada), indicate that these reports are without foundation and that the buying which accounted for the rise was purely of an investment character. One important brokerage house in Montreal has been putting its clients into Canada Cement, and another house which has long been identified with this security has been advising clients to take profits. The buying house, it is said, is quite satisfied with the average price which its clients have paid, believing that from the investment standpoint Canada Cement shares are showing or in the near future will show material appreciation even above the present level.

This view is based on the policy of the company in the matter of general write-offs before dividends and the building up of an outstanding balance sheet, investment account having grown from $2,348,412 in 1921 to $7,739,741 in 1925.

Cincinnati Convention of the Sand and Gravel Industry Largest in History

National Association Now Functioning as a Live Research and Promotional Organization — Hugh Haddow, Jr., Re-elected President

DUE in no small measure to the activities of the local Cincinnati convention committee, the eleventh annual convention (with the first annual exhibition) of the National Sand and Gravel Association was the largest, most representative and most instructive meeting in its history. The association is on a firmer financial basis than ever before. The engineering and research division has given a splendid account of itself; and expansion of this division and its work is one of the immediate aims of the organization. Much progress has been made by the ballast committee in modernizing specifications for railway ballast, and in making helpful contacts with railway engineering officials. Some progress has been made toward the difficult goal of standardization of sizes of sand and gravel. A standard depreciation scale for machinery and equipment has been developed and recommended for adoption by a special committee. A very great deal has been accomplished in many lines of service by the executive secretary.

Abstracts of the detailed reports on the year's work of the association follow:

Report of the President

Hugh Haddow, Jr.

The activities of the association during the past year have been quite fully covered in the reports of the secretary-treasurer, executive secretary, director of the engineering and research division, and of the chairmen of the committees on specifications for standardized sizes of sand and gravel and on a standard depreciation scale. These are appended to this report.

Only a casual reading of Secretary-Treasurer Shiely's report is necessary to learn that the association is on a sounder financial basis that ever before. It is solvent, with no outstanding obligations, and has been able to accumulate a comfortable cash surplus.

Executive Secretary Ahearn, in his report, refers in detail to the many activities of the association during the past year. His mention of income tax, freight rate, overloading, minimum weight, and car shortage problems illustrates the wide variety of services which this branch of our organization has been able to perform. His report of the official publication of the association, *The Bulletin*, is particularly interesting. It shows that expenses have been reduced and income materially increased. It can be said that *The Bulletin* is practically self-supporting at this time. Mr. Ahearn's report undoubtedly demonstrates that the association has been of great service to the industry and to individuals in the industry.

The engineering and research division has been functioning for a year and is abundantly able to speak for itself. Mr. Walker's detailed report gives examples of the many different types of service which his department has been called upon to perform. Among the many classifications of his work should be mentioned engineering service to member companies, co-operation with engineering societies, research organizations, and associations of allied industries, publication of information demonstrating the desirability of using prepared sand and gravel, and his studies of test data from other research organizations. The expansion of this part of our work is one of the biggest problems before us at this time, and has had serious consideration by the officers and the executive committee. The work of the engineering division should be extended, but it cannot be extended with the present income of the association.

Hugh Haddow, Jr., re-elected president for 1927

Mr. Walker, in his report to the board of directors, has outlined several plans for his department. The adoption of any one of these plans is contingent upon having enough money to carry it through for at least five years. I have recommended to the board of directors some methods by which this fund might be raised and it is earnestly hoped by your officers and by the Department of Engineering and Research that the board may be able to recommend to the association a feasible plan for this extension. I personally feel that it is highly important that this work be expanded, if the usefulness of the association is to be increased to the best advantage. There can be no standing still; we must either go forward or backward. Which shall it be?

Mr. Stepanian's report for the committee on specifications for standardized sizes of sand and gravel outlines one of the most important activities which has been undertaken by this association. This committee has made a careful study of problems relating to testing sieves, commercial sizes of sand and gravel, and specifications for commercial sizes. The report this year is in the nature of a progress report, as they feel that they have not had an opportunity to make a complete study of these problems. They have considered plans for establishing themselves as a standing committee of this association and have presented these plans to the board of directors. The action of the board in this connection will be mentioned in their report.

Mr. Rogers, in the report of the committee on standard depreciation scale, indicates that satisfactory progress has been made in the development of a standard rate of depreciation which will be representative of the industry as a whole and which will undoubtedly carry considerable weight with the U. S. Treasury Department in the adjustment of income tax cases.

It has been possible for me to make frequent visits to Washington and to keep in close touch at all times with the work of the association. I want to commend the staff of the Washington office and to pay tribute to the efficiency, cheerfulness, and good feeling that exists there. The teamwork has been splendid and I believe that much of the ground gained has been due more to good teamwork than to the work of any individual star. An addition will be made to the staff of the Washington office during February. Charles E. Proudley, an engineer now employed in the Research Laboratory of the United States Bureau of Public Roads, has accepted a position which will consist of acting as assistant to both Mr. Ahearn and Mr. Walker. This will give these two men more freedom and more time for extension work.

As in the past, the executive committee has held open meetings in various parts of the country and feels that much good has been accomplished by these meetings. They have afforded opportunities to meet and talk with producers not members of the association, and thus we have been able to show the advantages of membership. We strongly recommend that this policy be continued and, if possible, be made more widespread. We must remain active if we are to continue to live in usefulness, and we must continue our efforts for increasing our membership. This association has reached a point where it is looked up to by the sand and gravel industry. Let us maintain and strengthen our position so that we may become stronger and more able to represent truly one of the large and vital industries of the country.

Treasurer's Report

J. L. Shiely

The report of the retiring treasurer showed the results of efficient and conservative management. The cash balance, after a budget of $35,500 was $5,949.78.

Report of the Executive Secretary

V. P. Ahearn

With the beginning of 1926, the association launched its engineering and research division, of which Stanton Walker is director. It thus placed the organization in a position to render even greater service to the industry it represents. Mr. Walker's report affords an understanding of what has already been accomplished and it points the way for still further progress in the promotional activities of the association. Manifestly, the new division has given acceleration to the activities of the organization in obeying the injunctions of our constitution that we shall devote ourselves to extending the use of products of member companies.

Prospects for 1927

Reliable estimates indicate that sand and gravel production in 1926 increased approximately 14% over 1925, although some sections of the country reported a decrease in production. Nothing appears on the business horizon for 1927 which would lead us to anticipate anything but a successful year. This is especially true with reference to highway work in many of the most prominent states which have been somewhat lax in 1926. The demand for our products for structural buildings also promises to be good, leading authorities in this field having declared that the construction bill of the nation this year would total over six billions of dollars.

The past year has witnessed a more active interest in the use of gravel for railroad ballast. Specifications of large trunk lines for this material have been taken from recommendations contained in the report of the washed gravel ballast committee of the national association, of which Earl Zimmerman is chairman. This committee worked earnestly and faithfully for the benefit of the industry as a whole, and we are confident that the gravel ballast market of the industry will assume larger proportions each year.

Western Rate Case

The action of the Interstate Commerce Commission in rejecting the petition of western carriers for a flat increase of 7½c per ton in sand and gravel rates was a fitting climax to the vigorous fight which the national association waged against this effort to increase the traffic burdens of our industry. When the petition for increased rates was first presented to the commission, western producers called upon the national association to provide a plan for resisting the proposal of the carriers. Within a short time, traffic attorneys and commerce counsel were engaged in the preparation of data and evidence which would support the contention of sand and gravel producers that the petition should be rejected.

The whole sand and gravel industry in the West united in submitting one case to the commission through the national association. This insured that the case would be complete and that it would be conducted at a minimum of expense. We have the word of many interested parties that the manner in which the association handled the interests of western producers left nothing to be desired. Our attorneys showed that the transportation charges on sand and gravel form a greater percentage of the delivered cost than any other commodity, and that sand and gravel pay more relatively per car and per car mile than the average revenue derived from the transportation of all classes of freight. It was also brought out that increases ranging from 86.7% to 236% have been made in sand and gravel rates since 1914.

In the past it seemed to be the custom to single the sand and gravel industry out for "special" increases in rates. Therefore, we have considerable cause for gratification in the outcome of the western rate case. The proposed increase of 7½c per ton, had it been approved, would have had a most discouraging effect and, perhaps, would have formed a precedent for similar action in other parts of the country.

Some of the carriers seem entirely unmindful of the fact that the sand and gravel industry is highly sensitive to rate increases. Ours is a low-priced product with a short market radius. An increase, however small, will bring about a distortion of the competitive relationships in the industry, while the same increase in higher valued commodities would not be noticeable.

Higher rates on sand and gravel often shut a producer completely out of his principal market. Acting in good faith, he has invested many thousands of dollars in real estate and plant facilities with the assurance of the railroads that he will have a rate into such a market that will enable him to compete. Then, without warning, an increase in rates goes into effect which destroys his investment. Certainly, the delicate balance in our industry warrants us in requesting special consideration.

One lesson to be drawn from the outcome of the western rate case is that sand and gravel producers, at times when the interests of the whole industry are threatened, must unite as a single body and pull together. Working without co-ordination, they will meet defeat at the hands of any agency, no matter what the form of attack.

Personal Service to Members

Space does not permit of a detailed description of the different classes of service requested, but we should like to refer to them briefly and in the following paragraph will be found an enumeration of some of the tasks which we were called upon to handle in behalf of members:

Information concerning switching rates in all parts of the country; assistance in preparation of addresses on the sand and gravel industry to be delivered before Rotary Clubs; permit from the War Department for construction of slackline cableway across a navigable river; depreciation on floating equipment used in the production of sand and gravel; co-operation in the organization of state associations; legal principles with respect to assessment of charges for repairing cars for sand and gravel loading; participation in organization of Regional Advisory Board of the American Railway Association; aiding in the preparation of publicity for local advertising campaigns; extension of time for filing tax returns; information from United States Patent Office; securing minimum weights on sand and gravel of 90% marked capacity of car; investigation to determine whether import duty can be levied on foreign aggregates shipped to domestic markets; cost system for sand and gravel plants; assistance in defeating proposals filed with railroad traffic associations which would penalize severely the overloading of sand and gravel; means of securing reparation for payment of unreasonable and unlawful rate on sand and gravel; handling with the United States Labor Department petition for admission to this country of foreign laborers; information concerning general practices of other producers with respect to discounts to dealers; car shortage complaints; installation of railroad scales.

There does not seem to be any end to the scope of these requests, and it is apparent that members consider this personal service of distinct value. One member company has stated that in a specific instance of individual service the association accomplished something where he had failed and that the value of it to him would pay his dues for many years to come.

With the increased staff of the association during 1927, we shall be even better equipped than heretofore to render personal service to the members of the organization. We want to encourage them to utilize fully this feature of our activities, and they may be assured that we shall give each request prompt and complete attention.

Income Tax Service

Through the retention of H. R. Stutsman as income tax counsel, the national association is in a position to render expert advice on income tax problems of its members. There have been an unusual number of requests for tax service during 1926, and these have permitted the association to be of great assistance to member companies.

In many cases, we have saved members the time and expense involved in making trips to Washington in connection with tax matters; we have performed such duties as arranging hearings before the Bureau of Internal Revenue, securing extensions of time for filing tax returns, ascertaining the status of long-delayed tax appeals, advising members as to their rights under the income tax law in specific cases presented for our consideration, and in other ways.

We hope to expand our income tax service during 1927, in view of the splendid utility which it has demonstrated.

Penalties for Overloading

In what may well be considered an outstanding example of unwise legislation, proposals were submitted during 1926 to the Southwestern Freight Bureau and the Western Trunk Line Committee, seeking the approval of member carriers for the incorporation in tariffs of severe penalties on the overloading of several commodities, including sand and gravel. As it was understood that those in favor of establishment of the rules contemplated recommending their application in all sections of the country, an issue was presented which demanded that the national association take steps to defeat the proposals at their source.

The proposals, in their essential features, provided that in case a car is found, after leaving point of origin and before arrival at destination, to be loaded in excess of the authorized maximum weight, its contents will be transferred into a car of suitable capacity, except (and here is where our opposition is inspired) that, if such a car is not available at the weighing station, two cars will be used, the weight of the entire shipment to be divided as nearly equal as possible, *the two cars to be billed at the actual weight, subject to the prescribed minimum weight for each car.*

Protests which the national association submitted to the Southwestern Freight Bureau, together with the co-operation of the Car Service Division of the American Railway Association, resulted in withdrawal of the proposal from the docket. We also

presented similar protests to the Western Trunk Line Committee, and there is good reason for us to anticipate that the committee will accede to our request for elimination of the proposal from their dockets.

We have contended that the regulations in question would place drastic and unfortunate restrictions upon the loading of sand and gravel. Taken together, they constitute an effort to penalize the shipper for making a mistake within narrow limits, even though his intentions may be of the very best. The national association and its members have co-operated unreservedly with the American Railway Association in bringing about the maximum loading of transportation equipment. When the reports of the Interstate Commerce Commission show that the average loading of sand and gravel during 1925 was 50.4 tons per car, while the average for all commodities was but 27 tons per car, we are justified in insisting that our efforts have been productive of the desired results.

Under the rules prescribed by existing tariffs, carriers are receiving the benefit of additional revenue which comes from the heavy loading of sand and gravel, whether that revenue be expressed in per car or per car mile earnings. In instances of overloading due to excusable errors in the estimation of car capacity by loaders, the carriers have heretofore lightened the load and used the material thus unloaded as compensation for their services. If drastic penalties are to be arbitrarily imposed by the carriers for overloading, then sand and gravel producers, as a measure of protection to themselves, must reduce the amount of material loaded into cars. Certainly this is something which we all want to avoid.

Rate Proposal on Coated Stone

Affording another example of a traffic activity in which the national association can properly engage, action was taken by the organization to defeat a proposal filed with the Western Trunk Line Committee which, if approved, would have given a commodity known as "coated stone" the advantage of sand and gravel rates.

As the interests of all our members in the affected territory were involved in equal measure, the association arranged a hearing before the Western Trunk Line Committee. At that time we pointed out clearly the different transportation characteristics of the two commodities and presented the committee with evidence which supported our contention that "coated stone," a manufactured product, should receive a higher tariff classification than sand and gravel, a raw product.

A full account of the hearing appears in the January issue of the National Sand and Gravel Bulletin. We are able to report that our progress in opposing this rate proposal has been very satisfactory.

Question of Minimum Weights

As a result of the efforts of the national association during preceding years, a minimum weight for sand and gravel of 90% of marked capacity of car has been authorized by the Trunk Line Association, the Central Freight Association and the Western Trunk Line Committee.

Previous to that time a minimum of marked capacity of car had prevailed. This was a source of endless annoyance and heavy expense to our member companies. Although the proper authorizations have been issued by the railroad associations named above, it has been discovered that several of the carriers have not amended their tariffs and are still publishing a minimum loading based on marked capacity of the car.

Several such cases have been handled by the national association during 1926, including minimum weights in southwestern territory, southern territory and also in Illinois. We have been successful in persuading the carriers to establish the correct minimum. If any member company which now has a marked capacity minimum desires to gain the advantage of a 90% minimum, a communication to that effect should be forwarded to the executive secretary for handling with the interested carriers.

Car Supply Problems

During the early part of October, members of the national association were furnished with an accurate and comprehensive report pertaining to the car supply situation. A transportation shortage was threatening at that time and our report dealt with the prospects for future service. Arrangements were made for reporting instances of car shortage at member companies' plants to association headquarters.

We were instrumental in eliminating several instances of car shortages not only during this period but throughout the year as well. The satisfactory results which have been secured by members this year with respect to car supply are attributable to the intelligent and efficient methods of the car service division of the American Railway Association. In submitting this report, we should like to bear testimony to the sincere co-operation which they have extended to us at all times. When car shortage complaints were presented to them for handling, prompt action was taken in each case to afford relief.

The National Sand and Gravel Bulletin

The official publication of the national association, the *National Sand and Gravel Bulletin*, is now practically self-supporting. The report of the treasurer shows that we have been able to effect substantial economies in the publication of our magazine while, at the same time, our revenue has increased.

In view of the fact that the magazine is no longer a source of great expense to the association, we have increased its circulation in order that it may reach interested people. The publication now goes to every commercial sand and gravel producer in the country, to all state highway departments, to officials of government departments, to public libraries and to other agencies which should be informed concerning the sand and gravel industry.

The interest on all sides which has been manifested in the *Bulletin* encourages us to develop it still further. We propose to double its circulation, to increase its size and to add to its editorial staff in the near future. We feel confident that the industry which the *Bulletin* represents will assist us in carrying out these plans.

The Bulletin Supplement

The *Bulletin Supplement* has been issued weekly throughout the year, with the circulation confined to members of the national association. It has kept the membership correctly and promptly informed concerning matters of peculiar interest to them. Each month we have mailed out with one issue of the *Supplement* the construction news service of the association, this being a regular feature of membership service which enables members to follow closely the amount of building activity in all parts of the country.

The engineering and research division has maintained a department in the *Supplement*, and by this means it has furnished members with engineering information of a practical nature.

The Machinery Exhibit

For the first time in its history, the national association has adopted the policy of conducting at its annual convention an exhibit of machinery and equipment used in the production of sand and gravel. There has been a splendid response to the announcement that the exhibit would be inaugurated at our 1927 convention, and leading manufacturers interested in the sand and gravel industry have reserved booth space.

It is our intention to have machinery exhibits at succeeding conventions of the national association. We believe that manufacturers will welcome the opportunity thus afforded to bring their product to the intimate attention of producers from all sections of the country who attend our annual gatherings, and we know that a comprehensive exhibit of machinery will be of great value to our industry from an educational standpoint.

Value of Organization

The national association has passed through the stages of experimentation. The vital necessity of such an organization as ours for the established sand and gravel industry no longer needs proof, for its record of achievement over many years has demonstrated that a strong, active association is essential to the continued progress of the industry.

The organization belongs to the membership. Its value will be measured by the support which it is accorded by those in the industry. Its possibilities are unlimited and the road to further attainment is straight before us.

Report of Engineering and Research Division

Stanton Walker, Director

It has been found that the fullest utilization of the engineering activities of the National Sand and Gravel Association has come from the individual service requested by member companies. They, being in daily contact with problems involving the use of their materials, are manifestly in a better position than anyone else to direct our efforts along the most profitable lines. Of necessity, most of the work of this nature has been carried out by correspondence. Only a few instances are necessary to illustrate the type of service which has been performed along these lines.

In several cases there have been opportunities to assist in counteracting unfavorable propaganda being distributed for the purpose of influencing engineers against the use of gravel. Generally, a critical analysis of the literature being distributed seemed all that was necessary to overcome its effects. Numerous inquiries of a general nature have been received. These have involved a comprehensive study of the subject of density, a review of literature on acoustics of building material, abstracts of the literature on Haydite, calculations of quantities of materials for a large number of different proportions of a member's product, furnishing

information concerning equipment for sand and gravel plants and many other inquiries of a similar nature.

Since the National Sand and Gravel Association covers the broad territory that it does, it is obviously impossible for us to perform much service by direct contacts. However, a number of opportunities have presented themselves for work along these lines. In one instance, at the request of a member company, a lecture was delivered before two groups of engineers in a vicinity where pit-run materials were a serious competitor. In another case we were of service in aiding one of our members in persuading a state highway department to include gravel in the specifications for a road on which it had been planned originally to specify only a competing material. In still another case we were of some service in having gravel, which had been rejected on a technicality, reinstated in the construction of a concrete highway.

Co-operation with Engineering Societies, Research Organizations, and Associations of Allied Industries

One of our most important functions is that of maintaining contacts with various engineering societies, particularly through their committee work. This work can be classed as true co-operation of the sand and gravel industry with the engineering profession. Through contacts of this nature we are able to present the viewpoint of the gravel industry before bodies of engineers engaged in studies of engineering materials. They, in turn, welcome any information which we give them, as it is of assistance to them in the formulation of specifications, test methods, etc., having to do with sand and gravel. Memberships are maintained in societies such as the American Society of Civil Engineers, the American Society for Testing Materials, the American Concrete Institute, the American Society for Municipal Improvements, etc. We are particularly active in the committee work of the American Society for Testing Materials and the American Concrete Institute.

An excellent medium through which the National Sand and Gravel Association can co-operate with such organizations is seen in the work of our own committee on specifications for standardized sizes of sand and gravel. The work of this committee is discussed in detail in Mr. Stepanian's report. As its name indicates, its purpose is to make recommendations for commercial sizes of sand and gravel and for specifications for the different sizes. These recommendations will undoubtedly be given serious consideration by such organizations as the American Society for Testing Materials and the American Concrete Institute. The engineering and research division has co-operated actively with the work of our committee on specifications for standardized sizes of sand and gravel. The writer is secretary of that committee. We stand ready to be of any assistance in our power to other committees of this association.

Researches are constantly being carried out by various government bureaus, engineering colleges and other organizations, which are of vital importance to our industry. We have kept in as close contact as practical with such researches, and in certain cases have been able to make suggestions which have resulted or will result in obtaining more complete information on sand and gravel.

A number of opportunities have been had to co-operate with trade associations of allied industries. Professor Abrams, director of research for the Portland Cement Association, has requested suggestions for researches which will be of benefit to our industry. Among the problems which we have suggested to him are the following:

(a) Studies of factors affecting the shrinkage of concrete.

(b) Further studies of the tensile and transverse strength of concrete.

(c) Effect of surface texture and shape of particles on their concrete making properties.

(d) Studies of the yield of concrete.

We are now co-operating with him in securing samples of gravel for use in carrying out certain of these tests.

Another example of such co-operation is the committee on plaster sands, consisting of representatives of the National Sand and Gravel Association, the National Lime Association, the Portland Cement Association, The Gypsum Industries and the United States Bureau of Standards. The writer is chairman of that committee. As a result of our work, a tentative specification for plaster sands has been prepared, and the United States Bureau of Standards has offered to carry out certain research work of interest in this connection. Numerous other opportunities for co-operation of this nature will undoubtedly present themselves.

Studies of Test Data

An extremely important branch of our work has been that of correlating existing test data referring to sand and gravel. During the past several years a great many researches have been carried out on concrete and concrete materials. Generally, however, these tests were made with some specific purpose in view other than the problems of the aggregate industry. As an example, a study carried out at the Structural Materials Research Laboratory on the effect of size and shape of test specimens contains considerable information with reference to gravel. In other instances general studies of concrete have been carried out with no attempt made, and properly so, to emphasize the information concerning sand and gravel brought out in the tests.

Among the more important subjects to which we have given attention are:

(a) The effect of grading of aggregate.

(b) Volume changes in concrete as affected by grading and shape of particles of aggregate.

(c) Transverse and tensile strength of concrete as affected by grading and shape of particles of aggregate.

(d) Density and yield of concrete as affected by density of aggregate.

(e) Workability of concrete as affected by grading and shape of particles of aggregate.

(f) Studies of the requirements for gravel for concrete aggregate and methods of tests to limit such requirements.

Certain of our studies in this connection have been described in articles published in the *National Sand and Gravel Bulletin* and elsewhere and others have formed the subject matter of correspondence with member companies. However, most of this information is being accumulated for future use.

Publications

Another feature of our work which we consider of major importance is that of distributing correct information concerning prepared sand and gravel through the medium of the *National Sand and Gravel Bulletin* and the technical press. Articles for this purpose have generally been prepared for the *Bulletin*. In a gratifying number of instances they have been reprinted in full or abstracted in various engineering magazines.

Plans for Future

Although we have accomplished certain tangible results, this first year's work of the engineering and research division can be said to have done little else than to establish a background for our future activities. It was necessary to obtain this background, and we feel that sufficient "atmosphere" has been obtained to enable us to point out where our work can be profitably expanded, if the means to do so can be found. When it is considered that the sand and gravel industry is spending something less than $40,000 per year on concerted promotion of its material, an infinitesimal proportion of the value of its annual output, and that only about half of this amount goes to engineering activities, it does not seem unreasonable to hope that means may be found to expand our work.

Consideration of the first part of this report will show that our work of this year has touched on many different phases of the promotion of properly prepared sand and gravel, on any one of which more than one man might have spent his time profitably. The addition of Mr. Proudley to the staff of the association, as outlined in Mr. Haddow's report, will, of course, bring about a fuller utilization of the resources of the engineering division.

The promotion of the use of sand and gravel by contacts with engineers in the field, would, I am confident, yield high returns. Local associations, notably the Missouri Valley Association of Sand and Gravel Producers and the Southern California Rock Products Association, have been able to do some work along these lines. However, these efforts are of necessity confined to limited territories, and it will be readily seen how little the national association can do along these lines with its present limited facilities.

The distribution of information concerning the use of prepared sand and gravel is an extremely desirable activity. We have done a considerable amount of work on this, and will continue to do so, but with better facilities we could make our efforts felt to a much greater extent. If we did nothing more than repeat the same information in different forms, we would obtain valuable results; someone has aptly said that "repetition is the soul of instruction."

The most important activity of all is to keep ourselves informed about the facts concerning our material. This permits of the profitable expenditure of as much effort as circumstances will permit. It requires, not only the correlation of existing data, of which there are great quantities, but the vigorous pursuit of new information. Basicly we are fairly well equipped to prosecute this work. We are familiar with information and sources of information. We feel that we have a fairly accurate knowledge of the most important questions on which new information is needed and the means for obtaining such information. However, our present personnel and facilities will permit us to carry out only a minute part of the work that should be done. We will grant that it is a fact that "Rome was not built in a day" and that we cannot hope to enlarge all of our activities to their seemingly desirable proportions overnight. However, we do feel that certain definite steps can be taken in the near future, looking toward more adequate facilities for carrying out the

work of the engineering and research division.

The establishment of some facilities for carrying out tests would add greatly to the prestige of the National Sand and Gravel Association and would enable us to learn the facts concerning our material and to counteract much misinformation. We would be able to draw our own conclusions from our own information, rather than to depend wholly on conclusions of other investigators, based, in many instances, on inadequate tests.

Some arrangement whereby field engineers could be added to the staff of the national association would not only add to its prestige, but be of great help in the promotion of properly prepared sand and gravel.

Plans for enlarging our work along the lines mentioned above have been outlined in detail before the board of directors.

Report of Committee on Specifications for Standardized Sizes of Sand and Gravel

Stephen Stepanian, Chairman

Someone has said, "Standardization is dynamic, not static. It means, not to stand still, but to move forward together." Your committeee, charged with the study of specifications for standardized sizes of sand and gravel, feels that it has made considerable progress, and it hopes that the result will be a movement "forward together." A great deal of correspondence has been carried on with the members of the committee and one meeting was held during the year,— in Columbus on September 16, 1926.

Studies have been made of the following questions:

(a) Sizes of testing sieves.

(b) Commercial sizes of sand and gravel.

(c) Specifications for commercial sizes of sand and gravel.

It should be pointed out that our work has been confined to problems pertaining to the specification of grading of sand and gravel without reference to the quality of the particles.

In spite of the considerable amount of work which the committee has been able to carry out, definite decisions had not been reached on many of the questions considered at the time this was written, and this report, therefore, is confined to a brief discussion of the problems involved. A meeting of the committee will be held during the convention, and it is probable that more definite recommendations than contained herein will be discussed in connection with the presentation of this report.

Sizes of Testing Sieves

Considerable work has been done on the standardization of sieves by the American Society for Testing Materials. However, there still exist many discrepancies in the recommendations made by different groups of that society. For example, in the case of coarse aggregate, committee D-4 on road materials recommend the use of screens with round openings, while committee C-9 on concrete and concrete aggregates of the same society recommend sieves with square openings. Most specifications for coarse aggregates of state highway departments are based on round sieves.

Our committee feels that it is not a matter of vital importance as to which set of sieves is finally selected as standard, but it does urge that it is important that a definite standard be adopted. The testing sieves finally adopted, whether round or square, will have no necessary influence on whether round or square openings are used in plant practice. The producer will merely adjust his current screening practice in such a way as to furnish a product which will meet the requirements specified on whatever set of testing sieves selected. As an example, if gravel which would just pass a 1½-in. square sieve were required and the producer desired to use screens with round openings, it would be necessary only for him to determine what round opening would make a separation equivalent to that of a 1½-in. square opening. This would probably be found to be in the neighborhood of 2 in.

As a result of a thorough study of the situation, the majority of our committee is inclined to believe that the square mesh sieves adopted by committee C-9 of the American Society for Testing Materials present the most logical solution of the problem, in spite of the fact that round openings are more generally specified at the present time. It was felt that the square mesh sieves offer the following advantages:

1. The use of square sieves facilitates the calculation of the fineness modulus. This factor is a measure of the grading of the aggregate proposed by Professor D. A. Abrams, and it is felt that its use will become more and more general. While it can be computed from analyses made on round sieves, the computation becomes quite complicated, and a general use of such sieves would not tend to encourage the use of the fineness modulus.

2. Since round sieves are not practical for the smaller sizes, the adoption of square mesh sieves for the coarser sizes seems advisable in order to make the set of testing sieves uniform from fine to coarse.

3. Square mesh sieves are recommended by committee C-9 of the American Society for Testing Materials, the American Concrete Institute, and the Joint Committee on Concrete and Reinforced Concrete. It is felt that the recommendations of these committees represent the most progressive trend and that the adoption of the square mesh sieve will be a step forward.

It should be pointed out, however, that specifications based on round openings should not be changed to square openings without making corresponding changes in the percentages specified.

The adoption of specific sieve sizes depends to some extent on other problems under consideration by the committee, and therefore they are not discussed at this time.

Commercial Sizes of Sand and Gravel

Sizes of sand and gravel which have been under consideration by this committee as commercial sizes are given in Table I. The sizes are stated in terms of square mesh sieves; a similar range can, of course, be stated in terms of round sieves. There is no thought that each sand and gravel producer will manufacture all of the sizes discussed. It is believed, however, that there is no case where the product of any producer cannot be fitted to accord with one or more of the sizes suggested.

Specifications for Grading of Commercial Sizes of Sand and Gravel

The committee has given serious consideration to specifications for the different sizes of sand and gravel discussed above. Proper specifications, it is felt, should be predicated principally on the idea of securing the use of materials of a high degree of uniformity. The chief difficulty encountered in formulating such a specification lies in the comparatively wide range in gradings of materials as between different localities. A specification containing limitations sufficiently wide to permit the most economical use of proper materials in different localities seems inconsistent with the desire to encourage the use of sand and gravel of a proper degree of uniformity.

While specifications for the different sizes have been prepared, this committee desires time for further consideration of them before presenting them before this body. Consideration is being given to a form of specification which will permit of adaptation to sand and gravel of different natural gradings and at the same time require the production of uniform materials. The specification under consideration would limit the tolerances on sieves representing the upper and lower limits, and place limitations only on the *range* in percentages passing intermediate sieves. The following is an example of this form of specification:

Passing 1½-in. sieve—not less than A%

Passing ¾-in. sieve — B% to C% (range from B to C not greater than D%)

Passing No. 4 sieve—not more than E%

The ease with which a specification of

TABLE 1. SUGGESTED COMMERCIAL SIZES OF SAND AND GRAVEL

Sizes under consideration by Committee on Specifications for Standardized Sizes of Sand and Gravel

Size	*Common Uses*
0—No. 8	Sand for sheet asphalt and bituminous concrete
	Sand for inside plaster
	Sand for cement grout filler for brick and stone block pavements
0—⅜ in.	Sand for concrete
	Sand for cement mortar bed or cushion for block and brick pavements
No. 4— ½ in.	Gravel for bituminous macadam or bituminous surface treatment
	Coarse aggregate for thin concrete sections; as, for example, curb and gutter work, building block, etc.
No. 4— ¾ in.	Gravel for maintenance of gravel roads
	Gravel for light reinforced construction
No. 4—1 in.	Gravel for light reinforced construction
	Gravel for concrete highway construction
No. 4—1½ in.	Gravel for reinforced concrete work
	Gravel for concrete highway construction
	Gravel for railroad ballast
No. 4—2½ in.	Gravel for heavy reinforced concrete work
	Gravel for concrete highway construction
¾—2½ in.	Gravel for foundation course of gravel or water-bound macadam roads

this form can be adapted to meet conditions in different localities, and at the same time demand a uniform product, is obvious. Such a specification requires, of course, that separate consideration be given to concrete proportions for different grading.

Future Work of the Committee

This committee recommends that it be continued as a standing committee of the association and that its name be changed to "Committee on Standard Specifications." We feel that such a committee can carry out useful work along the following lines:

1. Make further studies toward submitting definite recommendations for specifications for the different commercial sizes.

2. Formulate specifications for factors other than grading.

3. Maintain a close scrutiny over specifications of our material proposed by other bodies.

Discussion of Committee on Standardization

The committee on standardization of sizes met in the ballroom at 10 o'clock Monday morning. The session was open to all producers, the idea being to get some advance discussion on the report of the committee which had been printed and distributed. The report was acceptable to those present with some slight modifications. It was thought better to indicate the size of screen used by giving the width of the opening as well as the number and it was also thought better to represent the tolerances in the sample local specification by letters rather than figures so that it might be thoroughly understood that the specification was to be modified and not followed exactly.

Frank W. Welch of the Greenville Gravel Corp. wanted the specifications to describe exactly whatever was specified so that there could be no chance of confusion between a round hole and a square hole of the same diameter or between numbers of screens. He also wanted them to state exactly what was meant by size so that one man might not think of the average size of the product while another was talking of the limiting size.

E. Guy Sutton (Neal Gravel Co.) pointed out that it was possible that all specifications of aggregate depending on grading might soon be out of date as there was already a movement to sell aggregate on its concrete making properties according to the water-cement ratio, and buyers would be willing to pay for the aggregate that would give the greatest yield for the same strength. Sales were already being made on that basis, N. N. Battjes pointed out.

Alex. W. Dann (Keystone Sand and Supply Co.) told of the experience of producers in Pittsburgh since producers and engineers had co-operated to write a local specification. Both quality and economy of production had resulted as the producer could make better material by concentrating on a few sizes and he could make these sizes more cheaply.

John Prince (Stewart Sand Co.) said he thought that any specification should contain an ideal as a mark to shoot at. Tolerances from this ideal could then be arranged locally.

J. L. Durnell (Van Sciver Corp.) advised the committee "not to go into high" too soon. He thought there was a danger of drawing too rigid specifications which would work to the disadvantage of the industry.

The idea of continuing the committee as a standing committee was approved by all present. It seemed to be the consensus of opinion that a broad specification such as that submitted by the committee would be more acceptable than one which would attempt to set tolerances more definitely.

Report of Committee on Standard Depreciation Scale

Geo. A. Rogers, Chairman

Pursuant to a resolution adopted at the Atlanta convention of the National Sand and Gravel Association, a committee was appointed to study the question of a standard depreciation scale for the sand and gravel industry, and to report to the organization concerning the feasibility of submitting such a scale to the U. S. Bureau of Internal Revenue for the general use of the industry.

There are three outstanding benefits which may be cited as accruing from a standard depreciation scale: First, it will tend to minimize friction between the taxpayer and the Bureau of Internal Revenue; second, it will give the established sand and gravel producer more definite information than usually exists as to what is properly chargeable by way of depreciation; third, it will tend to eliminate cost inequalities which arise from unjustified discrepancies in depreciation rates and depreciation methods.

The work of the national association in this respect was prompted by studies of the depreciation committee of the Southern California Rock Products Association. The final recommendations of that committee are outlined in Table 1. After earnest deliberation, they arrived at the figures shown and came to the conclusion that the average economical life of a typical sand and gravel plant is seven years, or an annual rate of depreciation equal to 15%, if the plant is operated for eight months or more each year. By "economical life" is meant the usual, actual operating, repair and idle time. An allowance is made for normal credit or scrap value in establishing the number of years of economical life.

At a conference in August, 1926, with officials of the Bureau of Internal Revenue, the report of the depreciation committee of the Southern California Rock Products Association was submitted for consideration. It was urged at that time that the suggested scale represented the conclusions of a thorough investigation as to the life of various units of utility in the sand and gravel industry in California. The officers of the bureau expressed their appreciation of the data and advised that the scale would be distributed among the interested tax examiners. Thus it is assured that the bureau has on file for reference purposes scientific information with respect to average depreciation experiences in the sand and gravel industry in southern California, and we can be certain that it will be used liberally in the adjustment of income tax cases involving the industry in that section.

Work of National Association

After the national association committee had been appointed to investigate the practicability of a standard depreciation scale for universal application to the sand and gravel industry, its work was initiated by submitting to the various members the report outlined in Table 1, with a request that they consider the possibility of its being adapted to their local conditions and report as to whether it reflected average depreciation experiences of plants in the territories which they represented.

TABLE 1

Equipment	*Economical Life, Years*
Auto crane, gas	5
Auto crane, steam	6
Auto truck	3
Batchers	2
Bins	10
Boiler mountings	10
Buckets, elevator	1
Buckets, clamshell	4
Buildings	10
Cars, quarry	4
Cars, wood dump	4
Cranes, caterpillar	4
Cranes, gantry	6
Cranes, locomotive	6
Crushers, single roll	5
Crushers, jaw	8
Crushers, gyratory	8
Dragline, gasoline	5
Dragline excavators	5
Drap scrapers	1
Electric power equipment	5
Engines, gasoline	4
Engines, oil	5
Engines, steam	10
Hoists	10
Loaders	3
Locomotives, industrial steam	8
Locomotives, gas	5
Locomotives, electric	8
Motors	6
Pipe, galvanized	3
Pump, centrifugal	5
Rails	5
Rock drills	2
Scales	10
Shafting	10
Shovels, steam	5
Shovels, gas	4
Shovels, electric	6
Shovels, Diesel oil	5

The following items of equipment are so short-lived and uncertain that they are recommended for listing as operating expense:

Belting conveyor belts	Dipper teeth
Bin gates	Grizzlies
Buckets, dragline	Pulleys
Cables, wire	Screens
Chains, steam shovel	Screens, shaking
Chutes	Sprockets
Chute liners	Switches
Dippers, steam shovel	Ties

From our observation and experience, the average economical life of a typical sand and gravel plant should be fixed at seven years or an annual rate for depreciation equal to 15%.

DEPRECIATION COMMITTEE,
L. L. Rogers, Chairman,
W. C. Hay,
F. J. Gay.

The replies received furnish much important information, and they indicate clearly the widespread and uniform belief among members that real advantage is certain to

result to the industry from the establishment of a standard scale of depreciation, both in relationship to the Bureau of Internal Revenue and in the development of accurate cost data. The reports were additionally representative in that they comprise all types of operation, have been prepared by active officials of successful plants, and are based upon actual experience of the officials comprising our committee, as well as the experience of practically all of the operations in their district.

Brief excerpts from such committee reports follow for the purpose of providing in quick review their ideas with respect to necessary allowances to be made on account of location, type of plant, condition of use, etc.

Virginia—Believes that wooden bins should have life of only five years.

Colorado—Endorses without exception.

New York—Thinks that the rate of depreciation endorsed by the committee is generally rather high, but endorses schedule without change and thinks all members should similarly adopt.

Texas—The report from the Texas committee is very complete and involves definite opinions of eight operators in that district. It is suggested that better provisions should be made to cover items of marine equipment and that certain additions be made to the operating expense items, such as drive chains, railroad spikes and bolts, belt feeders, etc. A flat rate of 15% appears to be generally agreeable. Report contains an interesting analysis of actual experience showing that a composite rate of 14.3% was the actual result of practice in a given plant.

Illinois—Suggests certain added equipment items; also thinks office furniture and automobiles used by traveling men should be included. Generally agrees with the California report and is enthusiastic about concerted action by the association as compared with individual efforts. Raises question of amended returns for back years to display any new rate of depreciation adopted. (It is doubtful whether this question should be brought into a discussion of depreciation rates.)

Alabama—Endorses and believes schedule should be generally applicable. Raises the question of special treatment where plants have been constructed for a special contract or job and are of little use for transfer to another point.

Missouri—Thinks schedule "perfectly conservative." Suggests that rates be listed for steel and wooden boats and pontoons.

Tennessee—Believes that the rates suggested are too high generally, but states that schedule is not sufficiently inclusive for the entire industry. "Certain types of equipment which we have are not at all covered by your schedule." Raises the question of proper treatment of elevator buckets, but concludes with "a great many items which you list would seem to be properly rated."

Ohio—Believes schedule "covers situation very thoroughly and also satisfactorily." Believes that the life of electric motors might be increased to eight years.

Iowa—Expresses some doubt as to the fairness of a flat rate of depreciation, but states that California reports are "very close to being true."

Rates of Depreciation

While there have been relatively very few suggested changes in the rates established by the California committee, it might be desirable to add a few classes of assets not included in the original list and to give some further attention to the subject of bins, motors and pipe, about which there seems to have been the most comment regarding the possibility of altering rates.

Also, while it has been in the mind of many that a flat rate of depreciation might be applicable to the depreciable assets as a whole, it is hardly believed that the Bureau of Internal Revenue would be as favorably inclined toward such flat rate as it would on a separate rate on each unit of utility. In this connection it should be remembered that the constructive work of this committee will be found to be doubly useful if the ultimate recommendation can be made in such form as to constitute the basis of a uniform accounting system for the various producers, as well as avoiding certain of the frequent causes of dispute in members' dealings with the Treasury Department on their tax returns.

Report of Findings to Bureau of Internal Revenue

As soon as this committee has had the opportunity of analyzing carefully all the data now in its possession it may be advisable to issue a new questionnaire for the purpose of perfecting our studies of a standard depreciation scale for the sand and gravel industry. This report is sufficient to afford an illustration of conditions in various parts of the country, and it strengthens our conviction that the final work of the committee will be helpful to the industry.

When our report and recommendations have received the approval of the national association, we have in mind the formal presentation to the commissioner of internal revenue of such approved document and, thereafter, advising our members concerning the attitude of Treasury officials on the subject as a whole and carrying such changes as the commissioner felt were desirable. Our members would then, it seems, have essential and more or less standard data which would aid greatly in the preparation of tax returns.

Attitude of Bureau Toward Depreciation Studies

Although several trade associations and a great number of individuals interested in the broad phases of taxation have for a number of years been urging upon the Bureau of Internal Revenue the adoption of rates of depreciation for different classes of assets, that agency has failed to display active interest in the subject. In remote instances, without officially so stating, the Income Tax Unit has virtually adopted the result of studies made by a given trade or industry. Usually these have been relatively small sized and, in general, the subject has not been dealt with comprehensively. Only recently, however, it developed that a rather elaborate study of this subject has been made by the bureau and a pamphlet outlining a standard procedure in the future audit of tax returns was printed. The actual issuance of this document was the first definite indication to those outside of official circles that any intention of the change in policy was in mind. After the printing of a very limited number of these pamphlets, and for reasons not known, the type was ordered destroyed. Whether this means a withdrawal of the tentative offer to trade associations and interested taxpayers generally to place their depreciation ratings upon a definite and standard basis is not yet known.

It is the opinion, as we gather from discussion with officials of the United States Chamber of Commerce and as indicated in a news bulletin issued by that body, that the Bureau of Internal Revenue still desires, despite the failure to give further publicity to its plan, to receive reports of depreciation studies from various trade associations, to review such presentations, and if possible to reach a general understanding between the association and the bureau with respect to the rates of depreciation to be used, and the exact procedure under which they are to apply, and the exact procedure of their recordation, not only upon tax returns, but in the accounting records of the taxpayer.

Report of Directors' Meeting

The directors, each representing one of the districts into which the country is divided by the association, met at a luncheon Monday noon. Among the duties specified by the constitution for the annual meeting of this board is that of choosing an executive committee for the ensuing year to act with the officers of the association. Those chosen were R. C. Fletcher (Flint Sand and Gravel Co., Des Moines, Iowa), J. L. Shiely (J. L. Shiely Co., St. Paul, Minn.), J. D. Roquemore (Roquemore Sand and Gravel Co., Montgomery, Ala.), and R. J. Potts (Potts-Moore Sand and Gravel Co., Waco, Texas).

For directors at large the following were chosen: F. D. Coppock (Greenville Gravel Corp., Greenville, Ohio), H. S. Davison (J. K. Davison and Bro., Pittsburgh, Penn.), F. W. Peck (Muncie Sand Co., Kansas City, Mo.).

The following wire was sent to the National Crushed Stone Association in convention at Detroit:

OTHO M. GRAVES,
Book-Cadillac Hotel, Detroit, Mich.

The Board of Directors of the National Sand and Gravel Association meeting today have instructed me to extend to you and your association the best wishes for the success of your convention and the hope that your splendid organization may enjoy continued success. We pledge our co-operation in all matters that are of mutual consequence. HUGH HADDOW, JR.,
President.

The following were chosen as a board of directors for the ensuing year:

David Alexander, Petersburg, Va.; R. N. Battjes, Grand Rapids, Mich.; J. B. Blanton, Frankfort, Ky.; Reed C. Bye, Wilmington, Del.; J. E. Carroll, Buffalo, N. Y.; R. G. Dunn, Arkansas City, Kan.; F. W. Erlin, San Francisco, Calif.; R. C. Fletcher, Des Moines, Iowa; H. H. Halliday, Cairo, Ill.; Walter Jahncke, New Orleans, La.; J. H. Jensen, Janesville, Wis.; Milton McDermott, Knoxville, Tenn.; Joseph McGaw, Pittsburgh, Penn.; H. V. Owens, Utica, N. Y.; R. J. Potts, Waco, Texas; Fred Radcliff, Tulsa, Okla.; F. W. Renwick, Chicago, Ill.; C. B. Rogers, Los Angeles, Calif.; J. D. Roquemore, Montgomery, Ala.; J. L. Shiely, St. Paul, Minn.; W. L. Smith, Memphis, Tenn.; A. P. Turley, Parkersburg, W. Va.; L. R. Witty, Terre Haute, Ind.; Earl Zimmerman, Cincinnati, Ohio.

Will Hold Summer Meeting

The greater part of the meeting outside of routine business and the adoption of the

budget, was given to the discussion of a proposal to extend the activities of the board of engineering research. The directors were all in favor of the idea, as they can see the good that has already been accomplished by this department of the association. But an extension of the work naturally calls for more money and there was considerable discussion as to the best way of raising this money. It was thought that no action which would call for enlarged expenditure should be taken without the full knowledge of the membership and without giving the members ample time in which to consider such a move. So it was finally decided to bring the matter before the members at the convention and delay further action until a midsummer meeting. A meeting of the board of directors was then scheduled to be held in Chicago, June 21, and a meeting of all the members who can attend was set for the following day. At this meeting the members will be asked to consider a plan which has been adopted by the board at its meeting on the previous day.

The budget was adopted on a basis of continuing the present activities of the association. This includes the recent addition to the engineering bureau of Charles E. Proudley, formerly with the U. S. Bureau of Public Roads.

Value of Associations and Research

Several speakers stressed the value of industrial associations and cooperative research. They were G. S. Brown, president of the Portland Cement Association; Duff A. Abrams, director, Research Laboratory, Portland Cement Association; C. R. Stokes, manager, Highways Bureau, National Lime Association, and R. L. Morrison, director, Michigan State Highway Laboratory.

G. S. Brown said he recognized the National Sand and Gravel Association as an ally of the Portland Cement Association. He gave at length his experience with the formation, growth and expansion of the Portland Cement Association. An industrial association, he said, provides the only feasible and effective means for the solution of many problems common to an industry, such as the marketing of material of questionable quality by unscrupulous producers, and the imposition of questionable conditions by unscrupulous purchasers.

Through the agency of industrial associations, Mr. Brown said, industrial accidents are studied, and methods and means for reducing or eliminating them; costs can be studied collectively and great economies effected. Labor costs in the portland cement industry were cut about one-third in five years by such co-operation. Special production problems exist in all industries, and only by co-operative effort can the average producer afford the expert advice and research necessary for their solution. The collection of statistics, Mr. Brown said, is now a minor activity with well organized associations.

The competition for the public's dollar, Mr. Brown said, has in a considerable measure substituted competition between industries for competition between producers in the same industry, and this new kind of competition has become so widespread and so keen that it is doing more to overcome the evils which inspired the Sherman anti-trust law and similar statutes, than any law possibly could. The public is amply protected by the possibility of using substitutes whenever the products of any industry become more than fair-priced.

One great value of an industrial association, Mr. Brown said, is that derived from sustained, continuous effort toward an ultimate goal—a value very difficult to express. Special problems, which are incidental to individual producers, when referred to an association's staff of experts, become its major work—its success depends on their solution. The result is great progress in the expansion of markets and in cheapening production.

While selfish interest is, of course, the primary object in forming industrial associations, they can and do render real public service. The research done in connection with the use of cement in concrete is an example. The maintenance of the quality of the product must ever be the basic principle in any industry. Good service to the public results in good will from the public, Mr. Brown said. It is unfortunate, he said, that it did not seem possible to sell a material like sand and gravel under a brand name, but perhaps some way may be found for establishing a minimum standard of quality, and to base membership in the National Sand and Gravel Association upon the meeting of this requirement.

Mr. Brown said the outlook for the construction industry in 1927 was that it would be about the same as in 1926; while house and apartment building will probably be less, there will be about the same amount of highway construction, and probably more heavy industrial and engineering construction.

Duff A. Abrams described research as continuous and intelligent searching for the truth as revealed by nature's laws. He gave numerous examples of what research has done for such industries as aluminum, rubber, explosives, packing, canning, etc. He then discussed the research work of the Portland Association in some detail. Such research work, of course, is not a philanthropy. Concrete is a very complex material and its extensive use required knowing more about it. The ingredients of concrete are of almost infinite variety, of infinite number of proportions, and an almost infinite number of conditions under which it may be used.

Consequently it has taken many years of research to arrive at definite conclusions, for the proper use of the material was early recognized as of just as much importance to the cement producer as the quality of his product. The Portland Cement Association is now spending $150,000 a year on research and has a laboratory staff of 40 people.

Professor Abrams said that probably the most important discovery in this research work was the effect of excess water in the mix—the water-cement ratio theory. The proper amount of mixing water he said was at the present time a more important consideration in obtaining satisfactory concrete than the quality of cement, the quantity of cement or the grading of the aggregates.

The organization for industrial research, Professor Abrams said, must be honest, sincere and truthful; it must put the search for facts above all other considerations. And facts once discovered must be faced, favorable or unfavorable; they can't be dodged. Consequently research work must be in the hands of a competent person with adequate equipment.

The following suggestions were made for research by the National Sand and Gravel Association: on the problem of *effective size* and grading much remains to be determined; the amount of *yield* of concrete with various aggregates is important; the effects of the nature of the surface of aggregate particles; determination of more satisfactory definitions in connection with aggregates and the use of aggregates; the relative ease of mixing aggregates of various kinds in concrete; the determination of many physical factors in connection with aggregates; the problems of plant design and operation.

C. R. Stokes of the highway bureau of the National Lime Association read a paper showing how the aims of the associations representing two widely different industries were the same, and that there were many cases in which the two industries might co-operate. The sand and gravel men are anxious to see their product used to make good concrete only. As hydrated lime improves the workability of concrete it will be to the advantage of the sand and gravel men to have lime used in it. Similarly the lime men object to having lime used in poor concrete and they will object if they see concrete being made with dirty and poorly graded aggregate.

Mr. Stokes pointed out the advantages of lime in concrete, how it improves workability, aids in cases of irregular water content and fills voids, making concrete impermeable. He also described the use of hydrated lime as a filler in asphalt. This has recently been found to be very effective in stabilizing mixtures and has made it possible to use some gradings of sand which were unfit to use in asphalt mixtures with other fillers. He thought that the use of hydrated lime as a filler would furnish an outlet for the use of some fine sands now treated as waste products.

Lime plaster and stucco were treated in a general way, but the speaker did not go into a matter which is in need of investigation, the proper grading of sand to use

with lime plasters to obtain plasters of the greatest strength and durability.

The latter part of the paper was given to sand-lime brick and its possibilities as an outlet for the fine sand which is a waste product in a number of plants. This, of course, is of interest to those producers only whose product has the high silica content necessary to adapt it to sand-lime brick making.

R. L. Morrison, director, Michigan State Highway Laboratory, spoke primarily on gravel inspection methods, but mentioned that such inspection nowadays should, and in many cases does, include research work for better meeting specifications requirements. He gave some specific examples of research work of very practical application and value to the producers of sand and gravel. A material, obviously faulty, was condemned by a plant inspector and shipments stopped. Within 48 hours a sample of the material had been taken to the state laboratory, tested with Alumnite cement; and these tests showed that it was possible to continue the use of material with proper care and manipulation.

Gravel Railway Ballast

F. J. Stimson, assistant chief engineer, maintenance-of-way, Western Region, Pennsylvania Lines, gave a brief resumé of railway ballast history and development, from the times anything alongside the road was used, until now when great care and selection is used in the purchase of ballast material.

Depth of ballast is constantly being increased, and a common fault is lack of sufficient depth. Another problem is dust, which is not desired in any ballast material. The first attempt to improve gravel ballast, over the natural pit material, was to remove the sand and larger stones; next came washing, using washed, screened and crushed material, but without regard to the proportions of various sizes. An attempt to correct this has been made by the American Railway Engineering Association's ballast committee in the tentative standard specifications (published in Rock Products, March 20, 1926).

Mr. Stimson said it was very necessary to live up to these specifications if a satisfactory gravel ballast for first-class track was to be developed. He said the best aggregate of various sizes was still undetermined and that there was still much to be learned about gravel ballast. He said it was up to the gravel producer to give the railways what they want, as they want it, or the alternative was crushed-stone ballast, which, although it costs more, and is more expensive to place in the roadbed, does give very satisfactory results.

The present trend in gravel ballast, he said, was gravel without any sand, but having in material from ⅛ to ¼ in. to give the necessary stability to the rounded pebbles. To leave out all the fines is like trying to ballast track with marbles. About 3% of sand (less than ⅛-in.) is allowed in the American Railway Engineering Association specifications, but is considered "foul" material that would better be taken out.

Gravel in Highway Work

A. S. Rea, engineer of tests, Ohio State Highway Department, explained Ohio's highway improvement program. This state has a very diversified program, using all types of road surfacing, with specifications open to all kinds of aggregate. An important recent development in Ohio's road program is stage traffic-bound surfacing—the application of small sizes of aggregate to roadbeds of all kinds in a light carpet coat, which can be added to and built up into higher types of pavement. Over 1,500,000 tons of aggregates were thus used in 1926.

Mr. Rea then discussed available aggregates in Ohio at considerable length, saying that there are now 23 grades of mineral aggregate provided for in the state specifications. These had more to do with sizes than quality, although there are a considerable number of classifications as to quality, as, for example, gravel is divided into four classes in respect to quality.

R. L. Morrison, director, Michigan State Laboratory, who has already been quoted, described in detail the Michigan system of plant inspection (this was described in Rock Products, October 2, 1926). The training of these inspectors at the plant is designed to make them valuable to the producer, as well as to the state highway department, by making it possible for them to offer constructive suggestions for changes in operation and equipment which will help the producer to better meet specifications, although inspectors are forbidden to interfere with plant operation unless invited by the producer to make suggestions.

The familiarity the plant inspector soon obtains with the particular deposit and operation makes it possible for him to pass much material, particularly at large plants, by visual inspection. Subsequent sampling at the job and tests of the material at the state laboratory make rejections necessary, but this does not happen frequently, according to Mr. Morrison, and he said it was unavoidable.

Sand cores in gravel loadings, and segregation of sizes generally he said were the commonest causes of rejected material. He commended producers for their co-operation.

Frederick C. Field, chemist, the Asphalt Association, spoke in favor of oiling and surfacing gravel roads, and of reworking them as black base for asphaltic types of pavement. He said 10,000,000 tons of sand are used annually in asphalt pavements.

Mr. Field said the asphalt association was working toward broader specifications for sand in asphalt pavements, tending to allow many sands to be used which had heretofore been rejected. This was the result of research work by the Asphalt Association with fillers for asphaltic binders, which change the character of the binder to such a degree that great rigidity in the aggregate is no longer necessary—in other words such a careful grading of sand as heretofore required is not necessary. This will create a market for much sand now wasted.

Mr. Field said that under the Asphalt Association's recommended practice uncrushed gravel may be used in all types of bituminous roads except asphaltic macadam.

Design of Gravel Plants

One whole session was devoted to a discussion of design and operation of gravel plants.

Frank W. Welch, chief engineer, Greenville Gravel Corp., said gravel plant design had gotten beyond the experimental stage, but that there is no such thing as a standard plant design. He had yet to find a case where the designs of one plant could be adopted for another without extensive changes to meet special local conditions of infinite variety. Certain units in plant design, however, may be standardized with much resulting economy to the operators of more than one plant.

He traced the development of belt conveyor feeders from the reciprocating feeder, through the apron feeder to the rotary type, which he said was the final answer. However, not all material requires a feeder, for some will run freely without one.

Elevating the material to the top of the plant was the next operation discussed. Pumping is not economical for high lifts; belt conveyors for wet materials have to have too flat a slope, and consequently are too long; bucket elevators do not wear well; the balanced skip hoist is a sane solution, he said.

In order to use skip hoists, however, it was necessary to get the cost down and make other improvements, such as safety devices at the top to keep the skip from going too far. Mr. Welch is now using balanced skip hoists quite extensively in his designs. The power cost is about the same for a balanced skip hoist as for an elevator, but a larger motor is required and an extra man is necessary. On the other hand, there is considerable saving in maintenance costs, he said.

Mr. Welch discussed at length the advantages and disadvantages of elevating all the material to the top of the plant before scalping and screening. He is in favor of it for these reasons: (1) It avoids double elevation; (2) is less expensive to make the crushing plant a part of the main building; (3) the crushed material can be readily segregated and sold separately if desired.

The design of the plant proper depends largely upon what the biggest customers want the most of. In his latest designs Mr. Welch makes the various grades come out of triple-jacketed screens at approximately the same point, that is, the discharge spouts

come together so that the different sizes may be recombined in any desired proportions. In the matter of sand-settling devices, he said the drag-conveyor and screw washers were becoming popular because of their thorough dewatering of the sand, which was particularly advantageous at city plants, where the material had to be trucked through the streets.

He recommended separate motor drives for all machinery except crushers, in which case three or more units can be most economically driven from a single line shaft.

In bin construction he recommended provision for three or four parallel loading tracks under bins, rather than stringing out the loading tracks on a long tangent. This not only facilitates quick loading but is cheaper track construction. He had found very little provision for bin storage necessary—bins large enough to hold 1½ cars, while a car was being shifted, were ample, except for special sizes of material which take time to accumulate. He said 14-ft. clearance, if by-pass tracks for locomotives were built, was enough. Trucking plants with retail customers, of course, require more bin storage.

Whether to build the bins of wood, steel or concrete depended, Mr. Welch said, on local conditions, but wherever at all economical he recommended concrete as evidence of the producer's own faith in the type of construction he was trying to promote. Steel skeleton design is being used for most modern plants in the industry.

Mr. Welch recommended housing all the equipment, especially in the northern states. He said it protected men and equipment alike and made for greater efficiency and economy. Also, he said, be sure to provide trolley hoists throughout the plant, both to facilitate erection and to provide for handling repair parts.

In conclusion Mr. Welch said that it was impossible to adequately design a satisfactory plant until the producer had had actual experience with his deposit and his market.

Branding Sand and Gravel

Gordon Smith, secretary, J. C. Buckbee Co., engineers, described the Northern Gravel Co. operation, Barton, Wis., in considerable detail, mentioning particularly the experiment this company is making in publicity literature to give its products the brand name "Barton." The rest of Mr. Smith's address consisted of illustrated descriptions of the Oswego, Ill., plant of the Chicago Gravel Co., and the Crystal Lake, Ill., plant of the Wisconsin Lime and Cement Co. Both these plants have been described in detail in past issues of Rock Products.

Albert E. Reed, W. S. Tyler Co., said that the rotary screen survived in the sand and gravel industry only because it was also a good washer. He spoke in favor of vibrating screens and illustrated several recent installations in the sand and gravel industry—also some idealistic designs using vibrating screens exclusively. Some of his designs illustrated screening plants so simple that the whole thing could be moved about with a locomotive crane. He explained how such a plant could be installed for from $4,000 to $5,000—which brought to mind on the part of several listeners a certain article published in a contemporray magazine a few years ago on "How to engage in the sand and gravel industry with $10,000 capital"! Needless to say, if such a thing is possible, and no one who knows much about the industry believes it is, it would go hard with the established producers who have invested several hundred thousand dollars in single units of production.

Trucking Plants

Fred W. Cornuelle, Red Bank Gravel Co., Cincinnati, Ohio, gave his ideas on plant designs especially for trucking service. In this case, he said, storage capacity was a vital factor, and that money spent for storage would be well repaid. A trucking plant, he said, must be designed for flexible demands, ranging, say, from 200 to 1000 tons per day.

Mr. Cornuelle laid down the following principles for trucking plant design: (1) Ample storage to provide for peak demands, and shutdowns for minor repairs, also for bad weather conditions; (2) avoid ground storage piles, if possible, because of the fouling and weathering of the material; (3) provide for as dry a product as possible; (4) there being no satisfactory dewatering device to take out sufficient moisture for truck shipments, the best solution was extra bin storage so that the material could stand and drain for from 12 to 24 hours before loading; (5) for washing in cold weather it is better to use deep well water than river or lake water, because the temperature of well water is about 50 deg. as compared to about 32 deg. for the other; (6) driveways under bins should be just the correct width (9½ ft.), as too narrow driveways result in damage to the bin structure, and too wide ones lead to careless spotting of the trucks under the spouts, or gates; (7) closed-in bins are preferable, because salamanders may be used to keep material in them and the gates from freezing; (8) the silo type of wood bin is preferable, but square bins are more satisfactory because of the better provision for placing machinery and superstructure on top of them; (9) individual motor drives with speed reducers are desirable.

The operating capacity of the plant should be about equal to the peak-day demand, Mr. Cornuelle said; the location of the crushers is debatable, he favored crushers outside the screening and unloading plant.

Transportation

W. J. McGarry, manager, Open-Top Car Section, American Railway Association, told of the remarkable car-handling record of the railways in the fall of 1926 when the English coal strike created a very large movement of coal at a time when there was also a maximum movement of sand, gravel and stone. During the week ending September 4 the car loadings of coal were 20% above normal, and of sand and gravel 15% above normal, yet the railways handled this business with no more open-top cars than in 1920. This improvement is in a large measure due to heavier loadings and the co-operation of shippers and receivers in expediting loading and unloading cars.

Mr. McGarry said that high-side-open-top cars are no longer classed as "coal" cars, and that there never would be any more priority orders if the American Railway Association had anything to say about it. He said there was no expectation of car shortages, that the little trouble experienced in 1926 was in isolated instances only. He predicted that sand, gravel and stone shipments in 1927 would be at least as large as in 1926 and that the traffic in these materials would continue to grow as it has in the last few years. The railways are buying many new cars, but what is helping most is the enforcement of car service rules which compel the more poorly equipped railways to provide for more rolling stock.

Edwin Brooker's discussion of freight rates on sand and gravel is published elsewhere in this issue, and undoubtedly was one of the most valuable contributions to the Cincinnati convention.

Entertainment Features

The annual dinner dance was the best attended of any convention in the history of the industry—about 300.

Crushed-Stone Men Send Greetings

The following telegram was received from Otho M. Graves, president of the National Crushed Stone Association, in acknowledgment of the telegram sent by the directors of the National Sand and Gravel Association (see p. 65 of this issue):

Detroit, Mich., January 18, 1927.

The National Crushed Stone Association here assembled directs me to inform you how deeply we appreciate the spirit that inspired your telegram. We heartily reciprocate your good wishes and assure you of our desire to co-operate with you in all matters that pertain to our common welfare.

(Signed) Otho M. Graves.

Correction

A NEWS item on p. 104 of the January 8 issue of Rock Products, based on a local newspaper report, stated that floods had recently caused suspension of operations at the Plaster City, Calif., gypsum plant of the Pacific Portland Cement Co., Consolidated. The original report was obviously based on an unverified rumor, for Rock Products is informed by officials of the company that little damage was suffered, the plant was not closed at any time, and ample raw material is always carried at the mill to take care of all needs.

Machinery, Equipment Exhibits at Sand and Gravel Convention

FORTY-SEVEN manufacturers of machinery, equipment and supplies were represented with display booths at the Eleventh Annual Convention of the National Sand and Gravel Association, held in the Gibson Hotel, Cincinnati, Ohio, January 17 to 19, inclusive.

It was the first convention at which the association provided for exhibits of this kind, and for this reason the great success of the display is remarkable. The efforts of the manufacturers seemed to be received by sand and gravel producers with enthusiasm, due in great measure to the fact that most of the exhibits were truly educational, presenting new ideas on cost reduction and labor savings.

The list of exhibitors follows:

Allis-Chalmers Mfg. Co., Milwaukee, Wis. Several panels of original photographs of installations in sand and gravel plants and a complete assortment of literature made up their display.

American Manganese Steel Co., Chicago Heights, Ill. Exhibited a model of a 12-in. pump. Also photos of other pumps in use in sand and gravel industry.

Barber-Greene Co., Aurora, Ill. In addition to moving picture of its products in action, this company used its booth to exhibit working models of a conveyor loader and a bucket loader of the heavy duty type.

R. H. Beaumont Co., Philadelphia, Penn. This manufacturer required four booths for exhibiting a ½-yd. "Le Clair" scraper, a duplex and a simplex bin gate. A working model drag-scraper was operated in a miniature sandpit.

Blaw-Knox Co., Pittsburgh, Penn. In these two booths were exhibited an aluminum model of a batcher tank and a complete array of bulletins and booklets.

Brown Hoisting Machinery Co., Cleveland, Ohio. Displayed roller-bearing conveyor idlers and several racks of original photographs showing recent installations of material handling equipment in the sand and gravel industry.

Cement, Mill and Quarry, Chicago, Ill. Copies of current issues of this magazine were displayed.

Cincinnati Rubber Mfg. Co., Cincinnati, Ohio. This booth was filled with samples of rubber conveyor belting, dredge sleeves, sand suction hose, pressure hose and rubber chute linings. Also photos showing installations of conveyors and hose in sand and gravel plants.

Climax Engineering Co., Clinton, Iowa. A full-size type R4U Climax gasoline engine completely filled the booth. Also photos and literature describing all models and sizes.

The Dorr Co., New York, N. Y. This company displayed literature describing washing and other equipment manufactured for the sand and gravel industry.

Dravo Contracting Co., Pittsburgh, Penn. An assortment of photographs showing installations of machinery and floating equipment designed and built by them for the sand and gravel industry.

Eagle Iron Works, Des Moines, Iowa. Exhibited a working model of a sand and gravel log washer.

Fairbanks, Morse & Co., Chicago, Ill. Exhibited a full-capacity dial truck scale as well as a ball-bearing pump, direct-connected to a ball-bearing motor. Also displayed several photographs of installations of Diesel-engine-equipped dredges and towboats in use in the sand and gravel industry.

Farrell-Cheek Steel Foundry Co., Sandusky, Ohio. These people exhibited sprockets, chains, dipper teeth and other parts, cast of "Farrell's 85." Also photos and complete assortment of literature.

Fate-Root-Heath Co., Plymouth, Ohio. An attractive array of photographs showing locomotives in use in the sand and gravel industry, together with literature describing its complete line, made up their exhibit.

Gifford-Wood Co., Chicago, Ill. Displayed several racks of photographs showing material handling equipment, including conveyor loaders, skip-hoists, etc.

Harnischfeger Sales Corp., Milwaukee, Wis. Showed moving pictures of its machines in use at sand and gravel plants. Also bulletins and several photographs.

The Hayward Co., New York City. Exhibited a working model of a clamshell bucket, the operation of which was demonstrated through the use of a working model of a hoist and derrick.

Hendrick Mfg. Co., Carbondale, Penn. Exhibited perforated rotary and flat screens, plates and grating. Also an array of literature and a general catalog.

Ideal Concrete Machinery Co., Cincinnati, Ohio. A continuous showing of moving pictures of concrete products machinery was the attraction at this booth.

Insley Mfg. Co., Indianapolis, Ind. Exhibited its complete line of sand and gravel plant machinery and equipment. (This company also shared its booth with C. Taylor Hammond Co., Cincinnati, Ohio.)

Koppel Industrial Car and Equipment Co., Koppel, Penn. A complete display of photos illustrating equipment especially designed for the sand and gravel industry.

A. Leschen & Sons Rope Co., St. Louis, Mo. Exhibited samples of all sizes and types of wire rope.

Link-Belt Co., Chicago, Ill. Two booths containing an interesting working-model sand and gravel washing plant, complete with belt conveyors, bins, screens, etc. In addition, full-size vibrating screens. Motion pictures and racks of photographs.

Marion Steam Shovel Co., Marion, Ohio. Booklets describing all types of shovels, draglines and cranes were available in this booth.

Martin-Parry Corp., York, Penn. This company used its two booths to exhibit an all-steel dump body, especially designed for the sand and gravel trade.

Mead-Morrison Mfg. Co., Boston, Mass. Displayed original photographs showing hoists of all types in service in sand and gravel plants. (This company shared its booth with C. Taylor Hammond Co., distributors, Cincinnati, Ohio.)

Midwest Locomotive Works, Cincinnati, Ohio. Some excellent oversize photographs were displayed and literature describing all sizes of gasoline locomotives, from 3½ to 25 tons.

The Morrow Mfg. Co., Wellston, Ohio. Exhibited a working model of a sand and gravel washing plant.

The New Jersey Wire Cloth Co., Trenton, N. J. Samples of all sizes of "Jersey" wire screens were displayed.

Niagara Concrete Mixer Co., Buffalo, N. Y. The "Niagara" vibrating screen was on exhibit in this booth.

The Osgood Co., Marion, Ohio. An excellent assortment of photographs, together with bulletins, were on display in this booth.

Perfect Classifier Co., Nashville, Tenn. Displayed some elaborate drawings and photographs of sand classifiers.

Pit and Quarry, Chicago, Ill. Copies of current issues.

Rock Products, Chicago, Ill. Displayed current copies, including the Annual Review and Directory Number for 1926. Also reprints of articles of especial interest to sand and gravel producers.

Sauerman Bros. Co., Inc., Chicago, Ill. Moving pictures showing "Crescent" scrapers and its slack line cableway excavator were run by this company. In addition, the two booths contained a complete assortment of literature describing the Sauerman line of equipment.

Simplicity Engineering Co., Durand, Mich. Photographs and literature describing and illustrating the "Super Vibrator Screen" were on display in this booth.

Stephens-Adamson Mfg. Co., Aurora, Ill. "Sacon" and other types of conveyor idlers were exhibited by this company, together with an array of photographs and drawings.

Symons Bros. Co., Chicago, Ill. Displayed several photographs of Symons disc and Symons cone crushers.

Taylor Wharton Iron & Steel Co., High Bridge, N. J. Exhibited manganese steel and orbit steel parts for all kinds of sand and gravel plant machinery and equipment.

W. S. Tyler Co., Cleveland, Ohio. Two booths were used by this company to exhibit the "Hummer" vibrating screen and screening accessories.

Vulcan Iron Works, Wilkes-Barre, Penn. Booklets and original photographs showing locomotives in service at sand and gravel operations were displayed at this booth.

The Webster Mfg. Co., Chicago, Ill. Several photos and bulletins describing a complete line of conveying and elevating equipment were on display in this booth.

F. M. Welch Engineering Service, Greenville, Ohio. Displayed some full-size blue-prints and photos of sand and gravel plants designed and built by them.

G. H. Williams Co., Erie, Penn. Exhibited models of all types of clamshell buckets, the operation of which was demonstrated through the use of a working-model derrick and hoist. An interesting exhibit.

W. W. Williams Co., Columbus, Ohio. One booth was reserved for this company.

Convention Registration

C. A. Adams, Madison Sand & Gravel Corp., Hamilton, N. Y.; Chas. H. Adams, Climax Engineering Co., Clinton, Iowa; L. J. and Mrs. Adams, Ohio Gravel Ballast Co., Cincinnati, Ohio; V. P. Ahearn, National Sand & Gravel Assn., Washington, D. C.; Joseph C. Aldous, Mississippi Lime & Material Co., Alton, Ill.; David Alexander, Petersburg and Dixie Sand & Gravel Corp., Petersburg, Va.; E. A. Almquist, Eagle Iron Works, Des Moines, Iowa; W. C. Armstrong, Mid-West Locomotive Works, Cincinnati, Ohio; Douglass L. Arnold, Fairbanks-Morse & Co., Chicago, Ill.; Fred E. Artz, Marion Steam Shovel Co., Marion, Ohio; C. M. Ault, Barnes Sand & Gravel Co., Piketon, Ohio.

I. R. Bailey, Dayton Whirley Co., Dayton, Ohio; Guy C. Baker, Greenville Gravel Corp., Greenville, Ohio; F. G. Baldwin, The Baldwin-Tarvin Co., Cincinnati, Ohio; H. N. and Mrs. Battjes, Grand Rapids Gravel Co., Grand Rapids, Mich.; R. H. Baughman, The Morrow Mfg. Co., Wellston, Ohio; Jack Beauskid, National Sand & Gravel Co., Morrisville, Penn.; G. B. Bebout, Muskingum River Gravel Co., Zanesville, Ohio; Fred R. Beerman, Atlas Rock Co., Stockton, Calif.; Geo. W. Behnke, Simplicity Engineering Co., Durand, Mich.; Wm. H. K. Bennett, W. H. K. Bennett Co., Chicago, Ill.; J. Fennell Berger, The New Jersey Wire Cloth Co., Trenton, N. J.;

Wm. Berninger, A. Leschen & Sons Rope Co., St. Louis, Mo.; Chas. P. Biesanz, Biesanz Stone Co., Winona, Minn.; J. M. Bilisoly, The Dorr Co., Chicago, Ill.; F. A. Bingham, Northern Gravel Co., West Bend, Wis.; Paul P. Bird, Boston Sand & Gravel Co., Boston, Mass.; A. L. Blakemore, American Manganese Steel Co., Chicago, Ill.; J. B. Blanton, J. B. Blanton Co., Frankfort, Ky.; W. A. Bliss, Keystone Sand & Supply Co., Pittsburgh, Penn.; A. W. Boldebuck, Thomas Elevator Co., Chicago, Ill.; J. S. Bond, Allis-Chalmers Mfg. Co., Milwaukee, Wis.; A. W. Bowers, Cincinnati Rubber Mfg. Co., Cincinnati, Ohio; J. E. Bowker, Birnie Sand & Gravel Co., N. Wilbraham, Mass.; A. L. Bray, Taylor-Wharton Iron-Steel Co., Pittsburgh, Penn.; C. C. Brinley, Gifford-Wood Co., Chicago, Ill.; George Brokate, Home Sand Co., Fremont, Ohio; Edwin Brooker, commerce counsel, Washington, D. C.; W. N. Brown, Keystone Gravel Co., Dayton, Ohio; J. A. Bullen, Fountain Sand & Gravel Co., Pueblo, Colo.; E. T. Burnside, Shelbyville, Ind.; L. B. Burt, National Lime Assn., Washington, D. C.; H. S. Burton, Queen City Supply Co., Cincinnati, Ohio.

H. P. Caldwell, Ohio River Sand Co., Louisville, Ky.; R. C. Caleuss, Chas. Warner Co., Philadelphia, Penn.; David G. Callahan, The M. A. Callahan Co., Cleveland, Ohio; E. W. Campbell, The Dayton Gravel & Sand Co., Dayton, Ohio; Bradley S. Carr, American Manganese Steel Co., Chicago, Ill.; J. E. and Mrs. Carroll, J. E. Carroll Sand Co., Buffalo, N. Y.; Weston M. Carroll, J. E. Carroll Sand Co., Buffalo, N. Y.; W. F. Casey, W. Fred Casey & Co., Charlotte, N. C.; F. W. Chaffee, General Concrete Prod. Corp., Warren, Penn.; G. F. Climo, Brown Hoisting Machy. Co., Cleveland, Ohio; J. C. Codell, Winchester Sand & Gravel Co., Winchester, Ky.; Rose Collins and sister, Spruce Pine Sand & Gravel Co., Spruce Pine, Ala.; John J. Connor, Bartlett Hayward Co., Baltimore, Md.; Geo. H. Cook, Stewart Sand Co., Kansas City, Mo.; R. N. Coolidge, Dravo Contracting Co., Pittsburgh, Penn.; O. S. Conrades, St. Louis Material & Sup. Co., St. Louis, Mo.; F. D. Coppock, Greenville Gravel Corp., Greenville, Ohio; Fred W. and Mrs. Cornuelle, The Red Bank Gravel Co., Cincinnati, Ohio; A. C. Courtney, Branch Hill, Ohio; C. W. Crisler, Potts Moore Gravel Co., Waco, Texas; W. H. Crusey, Geo. L. Rack, Inc., Cincinnati, Ohio; Earl P. Cuny, Geo. L. Rack, Inc., Titusville, Penn.

C. E. Dalrymple, Raritan River Sand Co., New Brunswick, N. J.; A. W. Daniels, American Manganese Steel Co., Chicago, Ill.; Alex W. Dann, Keystone Sand & Supply Co., Pittsburgh, Penn.; B. G. Dann, Hendrick Mfg. Co., Carbondale, Penn.; S. P. Dannel, London Sand & Gravel Co., London, Tenn.; L. P. Darnell, Cincinnati Rubber Mfg. Co., Cincinnati, Ohio; H. W. Davant, The Osgood Co., Marion, Ohio; James R. Davidson, Cincinnati Quarries Co., Cincinnati, Ohio; A. E. Danis, T. J. Hall & Co., Cincinnati, Ohio; H. M. Davison, The Hayward Co., New York, N. Y.; H. S. Davison, J. K. Davison & Bro., Pittsburgh, Penn.; W. E. Deletombe, Dixie Sand & Gravel Co., Chattanooga, Tenn.; E. W. Dienhart, Acme Concrete Products & Gravel Co., Cement City, Mich.; John L. Dillard, The Sturm & Dillard Co., Syracuse, Ind.; Dan and Mrs. Donnelly, Ohio Gravel & Ballast Co., Cincinnati; Harry Donnelly, Ohio Gravel Ballast Co., Cincinnati, Ohio; R. N. Donnelly, Ohio Gravel Ballast Co., Cincinnati, Ohio; Wm. Donnelly, Ohio Gravel Ballast Co., Cincinnati, Ohio; George W. Doran, The Red Bank Gravel Co., Cincinnati, Ohio; Louis Drach, Cincinnati Quarries Co., Cincinnati, Ohio; J. H. Duffy, Ohio River Sand Co., Louisville, Ky.; J. N. Dugan, Cincinnati, Ohio; I. L. Durnell, Van Sciver Corp., Philadelphia, Penn.; L. T. Dyament, Ward Sand & Gravel Co., Oxford, Mich.

George M. Earnshaw, ROCK PRODUCTS, Chicago, Ill.; C. S. Edwards, Ft. Worth Sand & Gravel Co., Ft. Worth, Texas; V. B. Edwards, The Dravo Contracting Co., Pittsburgh, Penn.; J. H. Enochs, Harnischfeger Sales Corp., Milwaukee, Wis.; G. M. Estes, Ohio River Sand & Gravel Co., Cincinnati, Ohio; O. B. Euler, Simplicity Engineering Co., Durand, Mich.

Joseph F. Fitzpatrick, Fitzpatrick Sand & Gravel Co., Worcester, Mass.; R. C. Fletcher, Flint Crushed Gravel Co., Des Moines, Iowa; D. S. Foland, The Keystone Gravel Co., Dayton, Ohio; A. G. Folz, Sauerman Bros., Chicago, Ill.; J. R. Fox, Page Engineering Co., Chicago, Ill.; A. J. Forschner, R. H. Beaumont Co., Philadelphia, Penn.; A. E. Frosch, East Liverpool Sand Co., E. Liverpool, Ohio; M. R. Frink, Simplicity Engineering Co., Durand, Mich.; F. C. Fuller, Portsmouth Sand & Gravel Co., Portsmouth, Ohio; J. Earl Furrow, visitor, Muncie, Ind.

Jas. Gayle, Carrollton Sand & Gravel Co., Carrollton, Ky.; Abe Goldberg, Allis-Chalmers Mfg. Co., Milwaukee, Wis.; R. A. Goodwin, Cement Mill & Quarry, Chicago, Ill.; J. J. Gorman, Zanesville Washed Gravel Co., Zanesville, Ohio; Geo. F. Gower, Simplicity Engineering Co., Durand, Mich.; Harvey T. Gracely, Marion Steam Shovel Co., Marion, Ohio; James H. Gregory, Barber-Greene Co., Aurora, Ill.; Roy and Mrs. Groves, The Ohio Gravel Ballast Co., Cincinnati, Ohio.

Mr. and Mrs. Hugh Haddow, Jr., Menantico Sand & Gravel Co., Millville, N. J.; Mr. and Mrs. H. P. DeHart, W. S. Tyler Co., Cleveland, Ohio; Mr. and Mrs. D. P. Hall, T. J. Hall Co., Cincinnati, Ohio; F. E. Hall, T. J. Hall Co., Ohio River Sand & Gravel Co., Cincinnati, Ohio; Mr. and Mrs. H. H. Halliday, Halliday Sand Co., Cairo, Ill.; C. Taylor Handman, The C. Taylor Handman Co., Cincinnati, Ohio; J. F. Hardyman, Linstone L. & F. Co., Maysville, Ky.; L. F. Hart, Wabash Sand & Gravel Co., Terre Haute, Ind.; E. E. Harton, Midland Barge Co., Midland, Penn.; D. C. Harris, Browning Crane Co., Cleveland, Ohio; John B. Heiser, Galion All Steel Body Co., Martin-Parry Co., Galion, Ohio; E. J. Henzerling, The Cincinnati Rubber Mfg. Co., Cincinnati, Ohio; G. G. Hill, Halleck & Hill Gravel Co., Bloomfield, Mo.; I. Rutledge Hill, Gifford-Hill & Co., Inc., Dallas, Texas; Henry R. Hissrich, Goodman Engine & Machine Co., Pittsburgh, Penn.; H. M. Hobbie, Roquemore Gravel Co., Montgomery, Ala.; Mr. and Mrs. Herbert H. Hoffman, Geo. J. Hoffman Co., South Bend, Ind.; E. P. Holnadel, The Red Bank Gravel Co., Cincinnati, Ohio; C. A. Homer, Mo. Portland Cement Co., St. Louis, Mo.; Clifton Hoolihan, The Keystone Gravel Co., Dayton, Ohio; H. J. Hougland, Eagle Sand & Gravel Co., Inc., New Orleans, La.; Walter E. Howard, Byrne Conway Co., Cincinnati, Ohio; Leo and Mrs. Huber, F. G. Ader Construction Co., Newport, Ky.; C. S. Huntington, Link-Belt Co., Chicago, Ill.

Jacob Iler, Dayton Gravel & Sand Co., Dayton, Ohio; C. D. Ireland, Montgomery Gravel Co., Montgomery, Ala.

Henry Jameson, C. Taylor Handman Co., Cincinnati, Ohio; V. O. Johnston, Lincoln Sand & Gravel Co., Lincoln, Ill.; F. J. Jonett, Winchester Sand & Gravel Co., Winchester, Ky.; F. H. Jones, The Dorr Company, New York, N. Y.; L. B. Jones, The Browning Crane Co., Cleveland, Ohio; W. A. and Mrs. Jurgensen, Ohio Gravel Ballast Co., Cincinnati, Ohio.

Harry P. Kelly, Blaw-Knox Co., Cincinnati; Edward Kammer, The Keystone Gravel Co., Dayton, Ohio; B. H. Kersting, The Dravo Contracting Co., Pittsburgh, Penn.; H. C. King, Martin-Parry Corp., Norwood, Ohio; A. H. Krigger, Brookville Locomotive Co., Pittsburgh, Pa.; Mr. and Mrs. L. A. Kuenzh, The Eden Gravel Co., Upper Sandusky, Ohio.

Lillian Lange, Queen City Crushed Stone & Sand Co., Cincinnati, Ohio; A. J. Lichtinger, G. H. Williams Co., Erie, Pa.; Joseph E. Lloyd, The E. T. Slider Co., Louisville, Ky.

W. P. McCarren, W. P. McCarren, Hannupburg, Ohio; W. S. McDonald, R. & J. Dick Co., Inc., Cleveland, Ohio; W. J. McGarry, American Ry. Association, Washington, D. C.; Joseph R. McGaw, Ohio River Sand Co., Pittsburgh, Pa.; George McHaffie, Paris Sand & Gravel Co., Hamilton, Ohio; C. T. McLaughlin, General Electric Co., Schenectady, N. Y.; Mr. McMay, Allis-Chalmers Mfg. Co., Cincinnati, Ohio; A. N. McQuoin, Cosumers Sand Co., Topeka, Kas.

Frank M. Maher, Ideal Sand & Gravel Co., Salt Lake City, Utah; E. P. and Mrs. May, Union Sand & Gravel Co., Huntington, W. Va.; Jack Marson, Barber-Greene Co., Aurora, Ill.; J. L. Marsters, Arrow Sand & Gravel Co., Columbus, Ohio; Robert Mawson, Pit and Quarry, Chicago, Ill.; Poole Maynard, Atlanta-Birmingham & Coast R. R., Atlanta, Ga.; H. MacWeill, Winchester Sand & Gravel Co., Winchester, Ky.; J. G. Metcalfe, Louisville & Nashville R. R., Paris, Ky.; Howard Miller, Elliott Machine Corp., Baltimore, Md.; H. J. Miller, H. J. Miller Lumber Co., Seattle, Wash.; R. M. Miller, Blaw-Knox Co., Pittsburgh, Pa.; Mary A. Moloney, Ohio Gravel Ballast Co., Cincinnati, Ohio; G. R. Moore, Sauerman Bros., Inc., Chicago, Ill.; D. H. Morgan, T. J. Hall & Co., Covington, Ky.; Raymond Miner, Webster Mfg. Co., Cincinnati, Ohio; Albert H. Morrill, Ohio Gravel Ballast Co., Cincinnati, Ohio; J. A. Morris, American Ry. Assn., Cincinnati, Ohio; J. F. Murtaugh, American Manganese Steel Co., Chicago Heights, Ill.

Perry Nagle, American Manganese Steel Co., Chicago Heights, Ill.; G. L. Nichols, Maine Sand & Gravel Co., Portland, Me.; Warren S. Nicol, Cross Engineering Co., Carbondale, Penn.; J. C. Nickerson, L. & N. R. R., Paris, Ky.; C. F. Neville, Western Indiana Gravel Co., Terre Haute, Ind.; O. S. Norton, E. T. Burnside Gravel Co., Farisland, Ind.; Frank J. Nugent, Koppel Industrial Car & Equip. Co., Pittsburgh, Penn.

Harold Olsen, Vulcan Iron Works, Wilkes-Barre, Penn.; A. E. Owen, Niagara Concrete Mixer Co., Buffalo, N. Y.

A. L. Palmer, Cincinnati Rubber Mfg. Co., Cincinnati, Ohio; C. E. and Mrs. Patty, Greenville Gravel Corp., Greenville, Ohio; F. W. Peck, Muncie Sand Co., Kansas City, Mo.; Chas. M. Peffey, Keystone Gravel Co., Dayton, Ohio; A. Perrin, Pit and Quarry, Chicago, Ill.; H. W. Peterson, Stephens-Adamson Mfg. Co., Huntington, W. Va.; Henry and Mrs. Phange, Queen City Crushed Stone & Sand Co., Cincinnati, Ohio; E. W. Pinkham, Lockwood Greene & Co., Inc., Boston, Mass.; P. M. Pirnie, Muncie Sand Co., Kansas City, Mo.; G. J. Podlesak, Fairbanks, Morse Co., Chicago, Ill.; J. F. Poland, Brown Hoisting Machy. Co., Cleveland, Ohio; W. Dick Pinngle, The W. S. Tyler Co., Cleveland, Ohio; C. H. Pundum, The Sturm & Dillard Co., Syracuse, Ind.; John Prince, Stewart Sand Co., Kansas City, Mo.; Ed. Procter, Genesee Gravel Co., Mt. Morris, Mich.; E. W. Purdy, Killbuck Sand & Gravel Co., Killbuck, Ohio; W. W. Purdy, Killbuck Sand & Gravel Co., Killbuck, Ohio; Robt. J. Potts, Potts-Moore Gravel Co., Waco, Texas; W. R. Purcell, The Ohio Gravel Ballast Co., Cincinnati, Ohio; S. R. Puryear, Perfect Classifier Co., Inc., Nashville, Tenn.

R. M. Quigley, Ft. Worth Sand & Gravel Co., Ft. Worth, Tex.

E. C. Read, U. S. Rubber Co., Cincinnati, Ohio; A. W. Redfield, United Fuel & Supply Co., Detroit, Mich.; Albert E. Reed, The W. S. Tyler Co., Cleveland, Ohio; J. W. Reed, Cincinnati Rubber Mfg. Co., Cincinnati, Ohio; H. G. Reifsnyder, Orr & Sembower, Reading, Penn.; F. J. Reinke, St. Louis Material & Supply Co., St. Louis, Mo.; F. Renzenberger, The Marion Steam Shovel Co., Marion, Ohio; J. L. and Mrs. Richmond, Union Sand & Gravel Co., Huntington, W. Va.; F. A. Risley, Madison Sand & Gravel Co., Solsville, N. Y.; M. L. Ritter, Farrell Cheek Steel Fdry. Co., Sandusky, Ohio; Nathan C. Rockwood, ROCK PRODUCTS, Chicago, Ill.; J. D. Roquemore, Roquemore Gravel Co., Montgomery, Ala.; B. Rondebush, The Ohio Gravel Ballast Co., Cincinnati, Ohio; G. C. Ross, East Liverpool Sand Co., E. Liverpool, Ohio; Edwin W. Ruckstubl, Willey-Ruckstubl Co., Cincinnati, Ohio; Harold C. Ryder, The Hayward Co., New York, N. Y.

Alfred J. Schaeffer, W. A. Jones Fdry. & Mach. Co., Chicago, Ill.; H. S. Schiefer, R. H. Beaumont Co., Cleveland, Ohio; A. K. Schifflin, Link-Belt Co., Chicago, Ill.; E. E. Scholer, Mo. Valley Sand & Gravel Assn., Kansas City, Mo.; Ed. and Mrs. Schreck, Concrete Material Co., Columbus, Ohio; C. L. Seaman, Niagara Concrete Mixer Co., Buffalo, N. Y.; Edmund Shaw, ROCK PRODUCTS, Chicago, Ill.; Wm. J. Shennan, Paxson Taggart, Inc., Philadelphia, Penn.; J. L. Shiely, J. L. Shiely Co., St. Paul, Minn.; W. E. Shivers, Ohio River Gravel Co., Parkersburg, W. Va.; Robert Simmes, Iron Clad Block Co., Newport, Ky.; R. W. Smart, R. W. Smart, Cincinnati, Big Four R. R.; Capt. Chas. A. Smith, J. K. Davison & Bro., Pittsburgh, Pa.; E. B. Smith, Waterbury Co., Chicago, Ill.; Frank B. Smith, Bucyrus Co., Pittsburgh, Penn.; Gordon Smith, Northern Gravel Co., West Bend, Wis.; W. L. Smith, Memphis Stone & Gravel Co., Memphis, Tenn.; John Sontag, Queen City Concrete Co., Cincinnati, Ohio; H. J. Stannert, H. J. Stannert Sand Co., Northumberland, Pa.; Geo. G. Stein, Fate-Root-Heath Co., Cleveland, Ohio; Stephen and Mrs. Stepanian, The Arrow Sand & Gravel Co., Columbus, Ohio; H. T. Stinson, Queen City Crushed Stone & Gravel Co., Cincinnati, Ohio; C. R. Stokes, National Lime Assn., Washington, D. C.; H. L. Strube, Link-Belt Co., Philadelphia, Penn.; L. E. Sturm, The Concrete Material Co., Columbus, Ohio; E. B. and Mrs. Suiter, The Suiter Material and Transport Co., Manchester, Ohio; I. L. Suiter, Suiter Material & Transport Co., Manchester, Ohio; E. Guy Sutton, Neal Gravel Co., Mattoon, Ill.; W. C. and Mrs. Swalley, G. H. Williams Co., Erie, Penn.; G. S. Swanson, G. H. Williams Co., Pittsburgh, Penn.; Don B. Swisher, Zanesville Washed Gravel Co., Zanesville, Ohio; H. R. Sykes, Mid-West Loco. Works, Cincinnati, Ohio.

J. M. Thistlewaite, Symons Bros. Co., Chicago, Ill.; Scott Thompson, Ohio River Sand Co., Louisville, Ky.; W. H. Tiemeyer, C. Taylor Handman Co., Cincinnati, Ohio; W. A. Tishon, River Sand Co., Steubenville, Ohio; E. S. Tompkins, Allen Cone Co., New York, N. Y.; G. H. Tompkins, Sauerman Bros., Inc., Chicago, Ill.; A. P. Turley, Ohio River Gravel Co., Parkersburg, W. Va.; Jack Turner, Barber-Greene Co., Aurora, Ill.; Loretta Thornbury, T. J. Hall & Co., Cincinnati, Ohio.

Newton B. Wade, Menantico Sand & Gravel Co., Millville, N. J.; J. H. and Mrs. Wagoner, Boonville Sand Corp., Utica, N. Y.; Stanton Walker, National Sand & Gravel Assn., Washington, D. C.; R. B. Warner, R. B. Warner Co., Cincinnati, Ohio; J. S. Watkins, Ky. State Highway Dept., Frankfort, Ky.; Chas. W. Weaver, Byers Machine Co., Dayton, Ohio; Frank M. and Mrs. Welch, Greenville Gravel Corp., Greenville, Ohio; R. A. Weldon, The Good Roads Machy. Co., Chicago, Ill.; N. A. Weston, Link-Belt Co., Chicago, Ill.; G. M. White, Good Roads Machinery Co., New York City; R. C. Will, Midland Barge Co., Midland, Penn.; Thomas F. Williams, Fitzpatrick Sand & Gravel Co., Worcester, Mass.; Geo. H. Williamson, J. K. Davison & Bro., Pittsburgh, Pa.; C. H. Woellert, The Doermann-Roehrer Co., Cincinnati, Ohio; W. T. Wroe, Morrow Mfg. Co., Welston, Ohio.

P. A. Yager, River Sand & Gravel Co., Owensboro, Ky.; Roy A. Yingling, Perfect Classifier Co., Inc., Nashville, Tenn.; C. M. Young, Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.

Max Zange, J. N. Dugan, Cincinnati, Ohio; Earl and Mrs. Zimmerman, Ohio Gravel Ballast Co., Cincinnati, Ohio.

The Value of Sand, Gravel and Crushed Stone Traffic to the Railroads*

By Edwin Brooker
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THIS subject, when considered from a transportation standpoint, is very interesting not only to the producers but to the railroads, and a knowledge by all parties is essential if producers are to maintain or secure that level of transportation charges which will reflect no more than a proper contribution to the revenues of the carriers.

The litigation before the Interstate Commerce Commission and the various state commissions during the past years may be blamed to a large extent upon those in charge of making the carriers' freight rates, chiefly because of a lack of knowledge of the value of these commodities as revenue producing traffic.

One of the chief factors was the fact that railroads formerly gaged their revenues by the ton and ton mile and not by the car or car mile.

I began to see the light back in 1915 after serving 15 years with the railroads and since then fully 75% of my work has consisted of the representation of sand, gravel and crushed stone producers in traffic and transportation matters and I have never passed up an opportunity to place before the carriers and governmental authorities facts which conclusively prove, when railroads' operating costs and gross revenues are taken into account, that sand, gravel and like commodities are among the most desirable traffic handled.

The favorable transportation characteristics of these commodities which speak for low operating costs are: The nature of the traffic and its value which enter into the character of the risk and the liability of the carriers in the handling, the density of the traffic and heavy loading which reduce operating costs per ton.

When cars of sand, gravel and like commodities are delivered to the railroads for transportation they are handling materials of value so low that in numerous cases the freight charges exceed the value of the traffic. These commodities are not subject to damage from the elements. We hear of occasional losses, but in such cases it is due to defective equipment or a wreck. Even then the material itself is not damaged and the carriers salvage it and use it for ballast. Rough handling does not damage these materials. We must arrive at the conclusion that the carriers assume no risk or liability in handling and the claims for losses are so negligible that they are not even given a classification in the claim records.

Compare this situation with that applicable to other commodities. Look at the value of a carload of live stock and the care which must be given in its handling. Look at the value of grain and grain products and their liability to damage and loss. Even coal is subject to a great amount of pilferage and numerous other commodities must be protected from the weather and given expedited service. A certain amount of the carriers' gross revenues received from the transportation of other commodities are used for the payment of claims for loss and damage to such traffic.

Transportation Economies

Sand, gravel and crushed stone are generally transported in open-top cars, the cheapest type of railroad equipment. We all know that the car is the unit of transportation. It represents a unit of investment upon which charges for interest, taxes, depreciation and repairs are computed, items forming a part of railroad operating costs. Throughout the process of billing freight, maintaining car records, accounting and service performed the car is the unit. Irrespective of the kind of traffic loaded, there are certain fixed items of expense chargeable to each car to cover interest on investment, depreciation, taxes, repairs, billing, accounting and the keeping of necessary records of car movements. It is true that this charge may differ according to the various types of equipment, but open-top cars represent the type with the lowest investment and consequently have the lowest fixed charges for interest, taxes, depreciation and the like chargeable against the car.

The weight of the individual car averages about 20 tons. This 20 tons represents dead weight which the railroads must transport whether the car is loaded or empty. All engines are rated according to their hauling capacities in the various localities. In making up the hauling capacity of the engine, or what we might term a trainload, the weight of the car itself is an important factor. The gross weight of a carload of freight which combines the weight of the car plus the weight of the freight is what determines the number of carloads which makes up a trainload.

Here is where the heavy loading of sand, gravel and crushed stone is an important factor. The average loading per car of these commodities is in excess of 50 tons per car. I have found average loadings in particular territories to run as high as 59 tons per car. Using an average loading of 50 tons per car and adding to it the weight of the car itself, we have a gross weight of 70 tons per car. In order to illustrate, let us use as an example an engine with a hauling capacity of 1200 tons. Such an engine can haul 17 cars loaded with sand and gravel of 50 tons with a gross weight of 70 tons per car. In these 17 cars at a 50-ton loading there is 850 tons of revenue paying freight and the remainder of the weight to make up the 1200 tons which is the engine capacity is dead weight of the cars used. The costs of handling a trainload of sand and gravel with a gross weight of 1200 tons is distributed among the 850 tons of revenue freight.

To go to the other extreme let us consider the handling of a trainload of live stock and live stock products, which, according to Interstate Commerce Commission reports for the year 1925, had an average loading of 12 tons per car. Again taking 20 tons as the average weight of the empty car, adding the average loading of live stock and its products of 12 tons per car, we have a gross weight of 32 tons per car. An engine with a capacity of 1200 tons can haul 37 carloads of live stock, which represents only 444 tons of revenue paying freight out of 1200 tons in the trainload. Considering the road haul train service only, it certainly does not cost any more to handle a trainload of sand and gravel with a gross weight of the train, 1200 tons, than it does to handle a trainload of live stock with the same gross weight of 1200 tons. In the case of sand and gravel it requires only 17 cars, whereas with live stock it requires 37 cars. Consider the investment of money in those 37 cars loaded with live stock as compared with 17 cars loaded with sand and gravel. Consider the interest on the investment, the allotment for taxes, depreciation, repairs, etc. Please bear in mind that the terminal service was performed on 37 cars in the one

*Presented at the National Sand and Gravel Association 1927 convention at Cincinnati, Ohio.

instance as compared with terminal service on 17 cars. In the weighing of the cars, 17 cars of sand and gravel are compared with 37 cars of live stock. In the billing of the cars, maintaining car records and accounting, the work performed on 37 cars of live stock is compared with the work on 17 cars of sand and gravel.

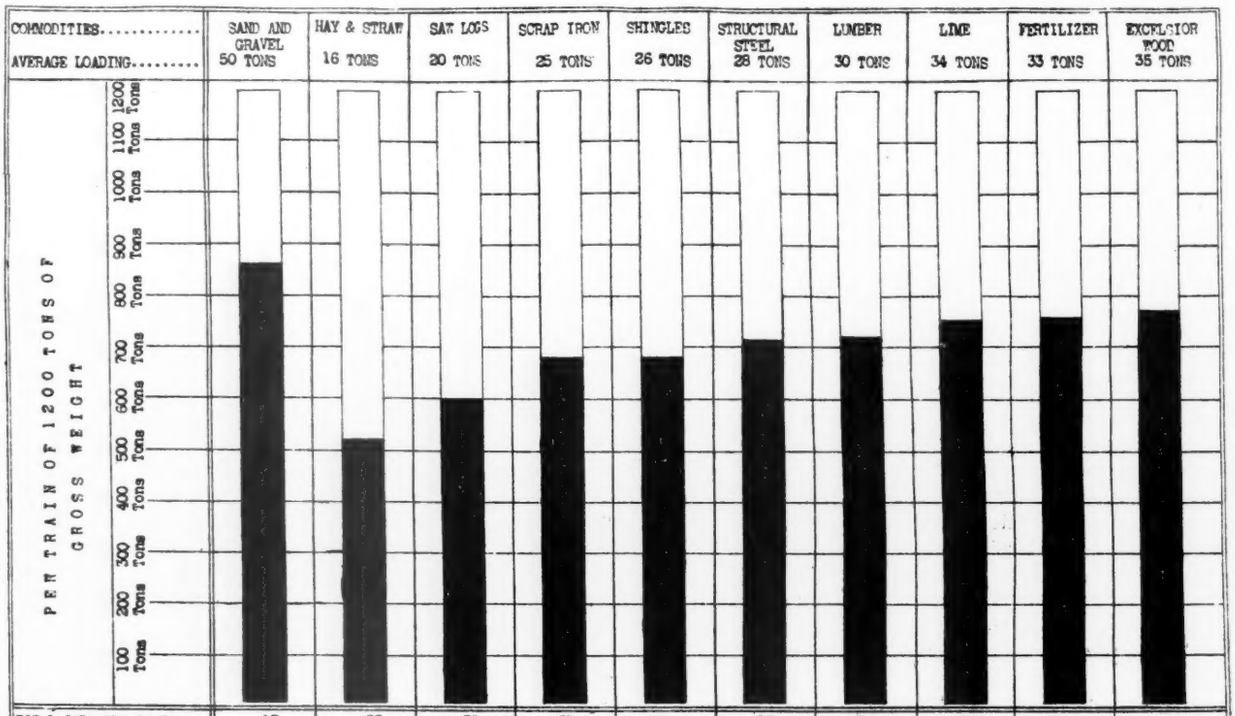
Suppose we apportion the actual costs of handling a train with a gross weight of 1200 tons among the 850 tons of sand and gravel and do the same thing with 444 tons of live stock. We have almost twice the cost per ton on live stock as we do on sand and gravel and that does not take into account the difference in the investment, interest, taxes, depreciation, terminal service, weighing, billing or accounting on 37 cars as compared with 17 cars loaded with sand and gravel.

We must also consider the value of 37 cars of live stock making up a trainload as compared with the value of 17 cars of sand and gravel. The risk and liability of the carriers in handling live stock is enormous. Such traffic must be handled with great care and given expedited service. Again I repeat, sand and gravel are commodities of low value, requiring no expedited service upon which the railroads assume no risk or liability in their transportation. The same ratio of costs of handling sand and gravel as compared with live stock in trainloads would apply to individual cars because in the one instance when using a car we have 50 tons of revenue paying freight and in the other car 12 tons of paying revenue freight.

Transportation service is divided into two parts, the road haul movement and terminal service which precedes and follows road haul. Every shipment receiving a road haul must have terminal service performed at origin and destination, and while the road haul costs on a particular traffic will differ, based on distance hauled, you will find the same general terminal cost applicable to a particular traffic, irrespective of the distance of the road haul movement.,

It is true that the cost of handling traffic in road haul movement increases with distance hauled, and as between long haul traffic and short haul traffic, but you will find greater costs for the long haul traffic per mile, because of the *intermediate* terminal service required on cars passing through division points.

Sand and gravel traffic is normally short haul traffic, requiring very little intermediate terminal service. The railroads receive a quick turnover on their cars. There is a minimum of car detention at the loading plants and at destination because the commodities are easily loaded and unloaded. Some established plants can load a car with sand and gravel in 15 minutes, at other plants it will take a little longer. It is, however, the invaria-



COMMODITIES	SAND AND GRAVEL	HAY & STRAW	SAW LOGS	SCRAP IRON	SHINGLES	STRUCTURAL STEEL	LUMBER	LIME	FERTILIZER	EXCELSIOR WOOD
AVERAGE LOADING	50 TONS	16 TONS	20 TONS	25 TONS	26 TONS	28 TONS	30 TONS	34 TONS	33 TONS	35 TONS
TOTAL CARS PER TRAIN	17	33	30	25	26	25	24	22	23	22
TOTAL TONS DEAD WEIGHT	340	678	600	525	524	500	480	452	441	430
TOTAL TONS REVENUE FRT.	860	528	600	675	676	700	720	748	759	770
FREIGHT RATE PER TON	$1.25	$1.90	$1.75	$2.00	$2.20	$2.80	$3.30	$2.00	$1.25	$1.10
VALUE PER TON	$0.80	$12.50	$15.00	$7.00	$23.00	$43.00	$25.50	$15.00	$47.00	$4.30
FREIGHT REVENUE PER CAR	$62.50	$30.40	$35.00	$50.00	$57.20	$78.40	$66.00	$68.00	$41.25	$38.50
VALUE PER CAR	$40.00	$200.00	$300.00	$175.00	$600.00	$1120.00	$770.00	$510.00	$1650.00	$150.00
FRT.REVENUE PER TRAIN	$1075.00	$1003.00	$1050.00	$1350.00	$1487.00	$1960.00	$1584.00	$1496.00	$ 948.75	$847.00
VALUE PER TRAIN	$ 688.00	$6600.00	$9000.00	$4725.00	$15000.00	$30100.00	$5610.00	$11220.00	$18365.00	$3311.00
RELATIONSHIP OF TERMINAL SERVICE BASED ON NUMBER OF CARS PER TRAIN	100.0%	194.0%	176.5%	147.1%	152.9%	147.1%	141.2%	129.4%	135.3%	129.4%
RELATIONSHIP OF ROADHAUL SERVICE PER TON BASED ON TONNAGE HANDLED	100.0%	162.85	143.3%	127.4%	127.2%	122.8%	119.4%	114.9%	113.3%	111.7%

Chart showing that the ratio of profitable to unprofitable tons hauled is greatest with sand and gravel. This is based on 1920 rates. The difference is even greater with 1926 rates

ble practice that when cars are placed at a plant in the morning for loading they are ready for delivery to the railroads that evening. From my experience in anlyzing the various situations at sand and gravel plants, I can safely say that the average car detention at all plants will not exceed 12 hours. On only rare occasions do producers detain cars at their plants for loading beyond the 48-hour free time allowed for that purpose.

Terminal Service

It is common knowledge that in switching service, engines are not working to their full hauling capacity. Most established plants have loading capacities of from five to 50 cars per day. The engine will take a string of empty cars from the yard and transport them to a sand and gravel plant for loading. It pushes this string of cars in on a plant siding, picks up all the loaded cars and returns to the railroad yards. In some instances engines will perform service at some other industries en route. When the loaded cars arrive at the railroad yard they are weighed and then classified by placing them on different tracks, according to their destination. They are then ready for the road haul movement. In many cases they will be taken from the plants and delivered at their destination without any yard service.

Railroads in handling sand and gravel are not performing terminal service on individual cars, but are performing the service on a number of cars at the same time. Does it take any longer for a switching engine to pick up and transport 10 empty cars from their yards to a plant than it does to perform the same service on one car? Does it cost them any more to place 10 empty cars on a plant siding than it does one car? Is there any difference in the service performed in picking up five or 10 cars of sand and gravel at a plant than the service performed on one car and how about the service in transporting such cars to the yard?

I say the difference in cost and service, if any, is very slight and, therefore, the engine hour costs in terminal service are prorated among more cars when sand and gravel traffic is handled than when switching service is performed at industries producing and shipping a lesser number of cars per day.

Here again is where the heavy loading of these commodities is an important factor, because not only does the density of sand and gravel traffic moving from a particular plant reduce the railroad terminal costs per car, but such terminal costs per car are distributed among at least 50 tons, while in the care of traffic with a lighter loading, such costs are distributed among a lesser number of tons per car.

In the year 1925 the carriers handled 145,402,178 tons of sand, gravel, clay and stone; in the same year they handled 109,-266,288 tons of agricultural products. It required only 2,883,917 cars to transport over 145,000,000 tons of our commodities, but it required 4,674,218 cars to transport a little over 109,000,000 tons of products of agriculture. In the one instance, in 8% of the total carloads handled, they handled 12% of the total tonnage handled, while in the case of agriculture in 13% of the total carloads handled there was only 9% of the total tonnage.

As compared with animals and other products, which includes live stock, meats, poultry, eggs, butter, cheese, wool, hides and leather, the carriers during the year 1925 handled 2,215,166 cars of such commodities as compared with 2,883,917 carloads of sand, gravel, etc. The tonnage of animals and other products, however, was only 26,223,862 tons as compared with 145,402,178 tons of our commodities. Products of forests, which include lumber, etc., is represented by about 1,000,000 more cars than sand and gravel, but the tonage of forests products is about 38,-000,00 tons less than sand and gravel.

In the entire eastern district covering over 59,000 miles of railroad, the carriers handled approximately 1,204,000,000 tons of freight during the year 1925. The average haul on this traffic was 149 miles. For this distance the carriers' average revenue on all traffic was only $46.90 per car.

High Rates Make Short Haul Business

The average freight rate today on sand, gravel and crushed stone for a distance of 20 miles is about 60 cents per ton This freight rate of 60 cents per ton at a 50-ton loading gives the carriers $30 per car for distance of 20 miles and less. The average haul of sand, gravel and crushed stone is estimated at about 60 miles, and the average freight rate for that distance about 80 cents per ton. Such a freight rate returns to the carriers $40 per car on sand, gravel and crushed stone for an average haul of 60 miles. Take a rate of $1 per ton for a distance of 100 miles, sand, gravel and crushed stone will pay the railroads $50 per car, while in the eastern district on all traffic for an average haul of 149 miles their revenue is only $46.90 per car.

In the southern district with an average haul of 219 miles on all traffic, the average revenue per car for the year 1925 was $60.70 and in the western district for an average haul on all traffic of 216 miles the average revenue per car was only $62.67. The average haul on all freight in the United States for the year 1925 was 181.6 miles with an average revenue per car for that distance of only $53.73.

If you take these average revenues on all freight per car of $46.90 for an average haul of 149 miles in the eastern district, $60.70 for an average haul of 219 miles in the southern district, $62.70 for an average haul of 217 miles in the western district and $53.73 for an average haul of 181 miles in the whole United States and compare them with sand and gravel freight rates for the various distances at a 50-ton loading you will see that the carriers' revenue on sand, gravel and crushed stone is exceedingly high as compared with the average revenues on all freight.

Sand, gravel and crushed stone traffic is generally short haul traffic, but it is made so by the high level of freight rates which, during the past few years, has caused a decentralization of the industry.

The gross and the net revenue received by the railroads for transporting sand, gravel and crushed stone traffic would be more at the prevailing rates than if that same car was engaged in the transportation of other traffic a greater distance and consuming the same period of time involved in the movement of two separate shipments in the same cars between short haul points.

It is unfortunate that no method has yet been discovered by which the actual operating railroad costs on a particular commodity can be ascertained. Continued presentations, however, of these facts in litigation involving freight rates on sand, gravel and crushed stone as well as in the producers' negotiations with the carriers for the establishment of rates will, in the end, place these commodities where they belong, in contributing no more than a just share of the transportation revenues of the carriers.

Gradual Recognition

In 104 I. C. C. 717 in the case of the Pennsylvania Sand and Gravel Producers Association vs. The Baltimore and Ohio Railroad Co. et al., the Interstate Commerce Commission said:

Sand and gravel are among the lowest grade commodities known to commerce and cannot move except at low rates. They are transported exclusively in open-top cars loading to and beyond the marked capacity of the car. Some plants load as high as 40 or 50 cars per day and the entire day's output is generally moved from the plant at the time empty cars are placed. An ample supply of cars is generally near at hand and loading is usually accomplished in 24 hours. The risk and liability of loss and damage is negligible. The movement is often in train lots and it is generally considered desirable traffic.

In that case the carriers computed their annual loss under the rates prescribed as being in excess of $614,000 and stressed this point in two petitions which they filed for a reopening of this case. In both instances the petitions for rehearing were denied by the Interstate Commerce Commission.

The examiner in a proposed report in I. C. C. Docket No. 17517, which has not yet been decided, repeats these same principles and recommends the establishment of lower rates in the southern territory.

More Than 500 Attend Convention of National Crushed Stone Association

Plan Enlarged Activities in Research and Other Lines and Hear of Progress in Standardization, Welfare Work and Other Problems of the Industry

EVERY annual convention of the National Crushed Stone Association, at least for several years back, has had the right to call itself "the largest and best convention in the history of the association." But the tenth annual convention, just completed at Detroit, overtops all that have preceded it to a considerable degree. Over 500 producers and others with allied interests had registered before the convention closed.

But attendance is not the thing that makes a convention great; it is the work accomplished. Judged by this the tenth convention stands as high as any that have preceded it. Arrangements were made for the first time whereby the memberships taken out bear some ratio to production; an enlarged program of research was adopted, two new regional vice-presidents were elected and real progress was made in such important matters as welfare and safety work and the standardization of crushed stone sizes and the standardization of equipment.

Growth

The growth of the organization in the year which has elapsed since the Montreal convention has been most gratifying to those who have the interests of the association at heart. In part this was due to the western trip of the officers which more than justified itself by bringing in about 150 new memberships and prospects of more. The report of this trip was one of the "high spots" in President Graves address. But the trip was only a part of the unceasing effort that has been put forth by the president, executive secretary and others to increase the membership in addition to their other duties.

At the annual banquet Toastmaster Bair announced that the nominating committee had considered no other name than that of Otho M. Graves for the presidency of the association. All that he said of Mr. Graves and the hard and self-sacrificing work he has done to advance the association was so obviously true that the members showed their appreciation by spontaneously rising and applauding. The mere writing of 5600 letters and traveling 29,000 miles which Mr. Graves has accomplished is a sufficient proof, as Mr. Bair said, that the presidency of the association is not so much of an honor as it is a job.

Presidential Review of the Year

THE tenth annual convention of the National Crushed Stone Association was opened by President Otho M. Graves at 10 o'clock on the morning of January 17 at the Book Cadillac hotel in Detroit. The representative of the mayor of Detroit (who was too sick to attend), Mr. Reed, was introduced and made a somewhat more appropriate speech of welcome than conventions usually listen to because he pointed out that one of the real problems of Detroit was to obtain a hard stone and a clean stone, and he hoped the industry might help the city to solve its problems of the production and distribution of road making materials. He gave some idea of the amount of stone the city uses annually by enumerating the hundreds of miles of road laid by the city and such projects as the sewage disposal plan which will run to $40,000,000.

Otho M. Graves, President, 1927

President Graves summarized the work of the association for the year, a part of what he said was as follows:

Perhaps the outstanding activity of the year was the trip through the middle west, the northwest, Pacific coast, southwest and the southeast of the officers of the association, more specifically your president, the directors of the Bureau of Engineering and the secretary, conducted by Mr. Rockwood. Somewhat has been written on this subject in the trade magazines so that it is unnecessary to go into detail as to the features which were covered in those articles.

We started the trip in Chicago without holding a meeting there, and our regional vice-president, Mr. Sanborn, went with us to the meetings in St. Paul, Madison and Omaha. He left us there and came back, and we went on through Cheyenne, Denver, Salt Lake City, Portland and down through the Pacific coast, through the south and up again.

It was rather impressive to me to note the extent of the interest of the highway departments, the engineering societies and the Chambers of Commerce and Boards of Trade. The highway departments were, of course, particularly interested in the fact that Mr. Goldbeck was with us, and although we had a far greater attendance at each of our meetings of those actively engaged in this industry than I had expected would be the case, nevertheless fully half of each meeting would be composed of engineers engaged in general construction work, contractors and from the state highway department.

I am very glad, however, to be able to tell you that we secured on the trip, without any undue pressure or any undue urging, some 130 memberships as a result of that trip, and more are coming in. It is difficult to estimate just how many will result from it, but 130 are assured and I think that before another three months is past it will have reached 150. If so, of course, it is obvious that the money which the trip cost was judiciously expended.

We found the industry active in every section that we visited. We found them anxious, in fact, to become a part of this national body, believing as they did that the industry could be assisted and prosper through a strong, vigorous, active, effective national trade body as we have been trying to become.

Contacts with Specification Making Bodies

At the convention at Cincinnati we were charged with the duty of maintaining a closer contact with the technical societies and institutions of the country in which we might properly be interested and in which our influence might be properly exerted. Summarizing briefly, this association is represented by Committee C-9, concrete aggregates, of the American Society of Testing Materials,

and on Subcommittee 5 of that committee, Committee E-1, methods of testing, and Committee D-4 on bituminous road materials. Mr. Goldbeck has just been appointed a member of the committee on awards for the best paper submitted to the American Society of Testing Materials. He is also chairman of the structural design committee of the National Highway Research Board, to my mind a committee which has a greater influence on highway design than any other group of men in the country today. We are also represented on the committee on research of the American Society of Civil Engineers, on the joint committee on concrete and reinforced concrete appointed by the A. S. T. M.; also on the American Engineering Standards Committee which is doing a great deal of authoritative work on the question of standardization. We also are on the committee on aggregates of the American Concrete Institute and on a sectional committee on tests for road materials which is sponsored by the American Society of Testing Materials and is composed of representatives from various technical societies.

Boards and Committees

I cannot pay too high a tribute to the energy, activity and sympathetic help and understanding of the other officers of this association, to the members of the board of directors, of the executive committee and of the chairmen of the various standing committees and the personnel of those committees. It is difficult for me to conceive how any group of men could have worked more loyally or more unselfishly, more whole-heartedly in support of an intangible something, such as an association is, than has this group of men. They met in Atlantic City at 10 o'clock in the morning and adjourned at 3:30 in the afternoon with no lunch, and with no idle conversation, but definitely confining the discussion to particular topics which were submitted to the board, rejecting some things and accepting others concerning the welfare of this industry, and I believe determined them as wisely as any body of men could possibly do.

The executive committee also met subsequently to the board meeting in New York. The committee being a smaller body, it is not so surprising that the proportion of attendance is even better than that in the board of directors, but so far as I recall in the four executive committee meetings held during the last two years there have been total absences of three, one absence being that of Charles Doolittle, who had broken his ankle and wired us that that was the only thing that prevented his coming.

The manufacturers division held its annual meeting in New York in October, and I wish I had time to discuss somewhat the rather remarkable growth of that Manufacturers Association, growth not so much in numbers but in spirit, and growth in spirit is always more to be desired than a growth in physical stature. We have made no effort to increase the membership among the members, and so far as I know those manufacturers who have joined with us have joined by their own solicitation asking if they might join.

The standing committees, to which one new one has been added, have been as active this year as heretofore. The committees will have a report to make for you, and I am not endeavoring to infringe in what I am saying now on what the committee will have to say for themselves later, which I am sure will be of interest to you.

The committee on research, of which Mr. McKee of Pittsburgh is chairman, held a meeting in Washington, and the committee on standards, of which Colonel Chamberlain of Chicago is chairman, subdivided its work even further this year than it did last year, and this year there were three active subcommittees, a subcommittee for the standardization of drilling equipment which we had last year, a subcommittee for the standardization of commercial sizes of crushed stone, a question which perennially is with us, and a subcommittee for the standardization of quarry tracks and cars.

The Associated General Contractors of America invited us to send a representative to a meeting of their board of directors in Kansas City to consider with them the question of the winter storage of crushed stone largely from the point of view of storing on the job. Their invitation came as a result of a considerable amount of work initiated by this association along that line of research. Mr. Sanborn, our vice-president of the north, was our representative and a very able one as you would of course expect. He will have a report to make to you on that subject.

Memberships

The membership as reported to you two years ago in Cincinnati showed 80 firms (I am speaking now only of the active members) holding 171 memberships. Last year in Montreal the report showed 156 firms with 427 memberships, and this year we have 211 firms with an indeterminable number of memberships, but at least 575. Probably if that could be accurately determined it would be about 600, but that is as may be.

The associate members during that time have increased from 58 to 82. A very proper criticism was urged several years ago that the percentage of manufacturers in this association was too high. Therefore, as a matter of interest largely to myself, and possibly to some of you, I determined that two years ago the percentage of members in this association of manufacturing members or associate members was 42.7%. Today it is 28%. It isn't that we don't want more associate members but we want so many more active members that the percentage will be kept sufficiently low that the membership of the associate members will be of even greater value to them.

Mr. Graves then took up the freight rate cases in which the association had appeared before the Interstate Commerce Commission. The Western Rate case is familiar enough to our readers. The case he considered of more importance, as establishing a precedent, was one brought by the National Slag Co. against eastern roads. The court held that "whatever basis of rates be adopted by the commission in this case should be made applicable as a maximum in crushed stone in the territory here considered." In other words, there is no reason for a discriminatory rate favoring slag.

Regarding future activities of the association, Mr. Graves expressed himself as strongly in favor of a laboratory for research, pointing out that it was poor economy to keep a testing engineer of Mr. Goldbeck's ability behind a desk writing letters. The cost of establishing a laboratory was gone into pretty thoroughly and also the question of finding the increased income necessary. Regarding this, Mr. Graves said:

Revised Plan of Dues

In that connection the board of directors at Atlantic City and at its meeting last night, and also the executive committee's meeting, have considered a revised plan of dues. It is an effort on the part of the board of directors to determine a plan of dues based still on our memberships of $25 each, but somewhat indicating on a tonnage basis in even 50,000 tons the amount of money which, if contributed for that tonnage, would give to this association an income of some $50,000, $55,000 or $60,000, and if we all subscribe to that basis as it is indicated I think it would be not only an equitable distribution of the financial burden, but that also it would be so light upon each individual company and so adjusted to the ability of that company to pay that the burden would be no heavier on one than on the other, and not in the least heavy on any.

There must be a change, as I have indicated, it seems to me, in our revenue and the method of obtaining the revenue through you, and also I believe we should work more closely on the budget system than we have been doing. I will not go into details about this; it is rather obvious that we should.

There should be certain modifications of the constitution and by-laws. It will be necessary to modify it if it will be your pleasure to adopt the resolution in the proposal of the dues.

I am also strangely of the opinion that we should have a regional vice-president of the southwest. And I very strongly believe that we need one or two more regional vice-presidents, and I wouldn't feel that that were worth mentioning if our vice-presidents had been as some vice-presidents are, so apt to be figure heads, just simply names in a list of officers. These vice-presidents have been active and vigorous. They wanted to work and they have worked. The first letter I had at the beginning of last year was from one of the vice-presidents. He said, "Am I supposed to be a figure head or do I get a job?" I think he had a pretty good job. We were very glad to distribute something for him to do and he did it admirably. The vice-presidents are working in that way, and that being so I feel it is safe to elect one or two more to establish one or two other divisions.

This association is going to grow. There isn't any question about it at all. The thing that concerns me is that we may not arrange for so sound a structure, a frame work, a steel work, that it will properly support the building which we try to hang upon it. We can get along for the time being with a very informal sort of an association, but if we come to that point, as I believe we will, where vice-presidents in charge of certain regions are active, vigorous officers in the local associations in those regions, over which he has a general supervision—I don't mean supervision in the sense of directing their activities because I believe in the autonomy and independence of the

local association—they would be very glad to have him in their territory to consult with as an official representative of the National Association.

President Graves then announced the nominating committee, made up of:

W. Scott Eames, Connecticut, chairman; John Rice, Pennsylvania; A. J. Blair, Minnesota; E. J. Krause, Missouri; Charles Doolittle, Canada; A. J. Wilson, California; Howard Bair, Ohio; W. M. Andrews, Pennsylvania; W. R. Sanborn, Illinois; F. W. Schmidt, Jr., New Jersey; Charles D. Brewer, Minnesota; Fred Murphy, Illinois; W. F. Wise, Texas; F. T. Gucker, Pennsylvania; M. B. Garber, Manufacturers' Division; S. R. Russell, Manufacturers' Division; J. W. Stull, Virginia, and A. L. Worthen, Connecticut.

In closing, Mr. Graves spoke of the passing of two ex-presidents in the past year as follows:

In Memoriam

"There will come a time in the convention activities when we can offer the only tribute which lies within our power to the two ex-presidents who have died during the past year, but it seems to me that before taking up any of the business of the association and entirely aside from such tribute as we may wish to pay them later as a mark of respect and affection and admiration for F. W. Schmidt and John J. Sloan, that it would be fitting and proper for all of us to stand for a moment."

The audience arose and stood for a few minutes in silence.

Reports of Directors

The directors of the association were then called upon for reports of conditions in the various districts.

Ohio, Michigan, Indiana

H. E. BAIR (Toledo, Ohio): Report of production and sales condition prevailing during 1926 and the outlook for 1927 in northern Ohio, southern Michigan and northern Indiana: Operation conditions were normal; that is, no noticeable improvement in operating methods or costs of production were effected. A number of new plants or old locations were built and others are being built to improve the preparation of the product as well as reduce future operating costs.

Labor and transportation service were satisfactory. The extremely wet season had the effect of causing an irregular movement in the commercial field and plants depending on this market alone were affected by increased costs. Generally, however, plants enjoying all forms of business gained through increased production and sale of ballast, chemical stone, concrete sales, etc., offset the loss in the commercial markets. The demand for agricultural products decreased over the year previous caused by weather conditions. A number of firms were quite successful in developing new markets for what is known as byproducts.

As no serious halt in general business activity in this section and elsewhere is anticipated, there is every reason to believe the transportation lines will be authorized to carry through a very large program of construction planned for 1927 consisting of ballasting, double tracking, grade separation and yard development. The various states, counties and municipalities have provided for an enlarged financial budget. Old increased demands in the road and street construction field are anticipated. Allowing for an improvement in weather conditions, the agricultural market should consume normal requirements as well as allowing for an increase to cover partial shortage in 1926.

Building activity in this section shows a steady annual increase which creates an annual increase of stone products for this purpose. Assuming business conditions remain normal, a market for a large tonnage of flux stone and chemical stone should be provided.

A number of firms are carrying over into the construction season a very large percentage of uncompleted contracts, all of which summed up with an anticipated increased demand in all markets leads us to conclude that the production and sales for 1927 will be above normal and very likely consumption will exceed any previous year in the history of the business. New plant and machinery installations planned and now being made along with increased production and demand should have the effect of reducing costs, but in view of the demand and the uncertainties of deliveries a price reduction isn't wise.

A. J. Blair of Wisconsin not being present, HARRY BRANDON of Piqua, Ohio, was called on and said:

Mr. Bair has gone into the situation so thoroughly there is little I might add.

The work has been good; very little price difficulty. The most serious difficulty we had was the very, very bad weather conditions during August and September. In our portion of the state there were 23 days of rainfall in September which held down our tonnage. If there is anything like favorable weather conditions we ought to start in producing a good tonnage at an early date. There is ample work in progress, proposed work in Ohio. Railroads in western Ohio have very large appropriations for improvements of all kinds, track elevations, double track improvements, and so forth, and generally speaking I would say 1927 is a very promising year.

Illinois and Indiana

L. R. CARTWRIGHT (Indianapolis, Ind.): My remarks are confined to central Indiana and Illinois, which territory is served by our operations. All producers were alike affected with excessive rains through the late summer and fall, which seriously retarded construction work. The result is that many jobs remain uncompleted and most of us have contracts for considerable tonnage which will not be delivered until spring, thus insuring a fair amount of early business for 1927.

These same weather conditions made it impossible for the farmer to use agricultural limestone, which practically cut in two the demand for this product. If weather permits, we believe there will be an increased call for agricultural limestone in 1927. To no small degree this improved condition is due to the untiring work of J. R. Bent of the Illinois Agricultural Association, who for years has been preaching the gospel of lime for sour soils.

An increased state highway program in both Illinois and Indiana will, we believe, give increased tonnage for this year.

Unusual developments have been made during the last year in bituminous constructions and maintenance. Mr. Goldbeck has visited our territory and rendered valuable assistance in this direction. It seems that a low cost bituminous maintenance with a surface as smooth as any other type of construction has actually been accomplished. This will open for improvement a large mileage of secondary roads as well as better the construction of much of our primary system. In all, we look for good business this year.

Chicago

O. P. CHAMBERLAIN (Chicago, Ill.): The season for 1927 in the crushed stone industry promises better business than 1926, provided contracts involving the expenditure of at least 25% of the $100,000,000 Illinois state bond issue are let within the next 60 days. Business will experience a notable pick up if the state highway department is able promptly to start this highway work.

It is the writer's opinion that building construction in the Chicago district will fall off as compared with 1926. There should, however, be a fair Chicago and Cook County business during 1927, probably 70% of the 1926 business. It seems likely that the territory within a radius of 100 miles of Chicago, which is really the market for the Chicago district, will demand a much larger quantity of crushed stone for concrete aggregates and other highway construction work than in 1926.

The prospect for a large volume of agricultural limestone depends entirely upon the financial condition of the farmers. The farmers of Illinois know the value of agricultural limestone. They will purchase in good volume if their finances permit. The unfortunate weather condition in harvesting the 1926 crops was a serious drawback to the 1926 agricultural limestone business. The disastrous results of the wet fall season of 1926 will be seriously felt at least during the early part of 1927. Should crops be good and weather conditions be fine the fall of 1927 will see a great revival of the agricultural limestone industry in Illinois.

Prices of crushed stone in the Chicago district have gradually declined during the past three years. While some of us are optimistic enough to hope for higher prices for 1927 than prevailed last year, these hopes can only be justified in case the market expands substantially to the limits obtained in 1923 when there was a large volume of concrete aggregate delivered for state highway work. Frankly, the entire Illinois situation, both in regard to prices, market and volume of production and deliveries, lies in the hands of the state administration. Crushed stone manufacturers in the state of Illinois will press this administration for action on the expenditure of at least a reasonable proportion of the $100,000,000 authorized more than a year ago, none of which has yet been either expended or obligated.

Ontario Conditions

C. M. DOOLITTLE (Hamilton, Ont.): The 1926 general conditions in Canada improved with a resultant beneficial effect on our industry. The earnings of the railways were greatly increased and their ballast requirements larger as a consequence of a better financial position. Labor was quite suffi-

cient to meet all demands and its efficiency was fairly high. Transportation facilities were 100% efficient, even at the season of greatest demand, namely, September, October and November.

Commercial users of crushed stone in Ontario are asking for a higher standard of aggregate, although we have not yet reached the point where pit run material has ceased to be serious competition. It is encouraging to us to know that 28 states in the Union do not allow the use of this material, and with the assistance of Mr. Goldbeck, it is hoped that our educational campaign will soon result in more rigid specification.

Nineteen hundred twenty-seven prospects are such that an increase in tonnage is looked for. The road building program should be equal to, if not better than, 1926. Railroad requirements for ballast will increase and the demand for stone for building construction certainly should be better. No car shortage or labor scarcity is anticipated in the coming year.

The demand for stone has increased during the past year and should be even better during 1927. It is not anticipated any attempt will be made to advance the prices, as it is felt by the operators that this healthy increase should be encouraged by a steady price.

The Federal and Provincial governments are reducing taxation as rapidly as possible and a considerable cut is looked for early in 1927. These tax reductions have a most helpful effect and any assistance from this quarter will result in better business for all.

I might mention here that the fee for all motor licenses in Ontario was reduced by $5 for 1927.

The production of agricultural limestone was curtailed in 1926 owing to unseasonable weather in the spring and fall. The tonnage of this material to move next year should show an increase, as on every hand a livelier interest is being taken in this product.

New England and New York

W. SCOTT EAMES (New Haven, Conn.): This report represents southern New England and part of New York City.

Owing to the severe weather in February and March we did not open as early in the spring of 1926 as in previous years. We usually start up about the middle of March, but in 1926 we started about the first of April. Our demand after starting was immediate and kept increasing as the season advanced. The demand was much greater in 1926 than in 1925. All stone producers in New England had a big year in 1926. This demand continued right up to the severe weather, which practically closed us down in December.

In New England we feel that 1927 will be equally as large as 1926. The price of stone is still very low in this section. This is due in a great measure to a large number of small producers scattered all over this section.

The railroad company took care of us very promptly and gave us very efficient service. We had no such delays as we have experienced in previous years.

During the past year we had a conference in Providence, R. I., with the state officials of Rhode Island, Massachusetts and Connecticut with Mr. Goldbeck. Following this conference we could readily see that Mr. Goldbeck's counsel was appreciated very much and it was a splendid help to the New England producers.

The railroads used quite a large amount of ballast in the past year and they have a large program that is going to require at least one or two years more to complete.

Our National Crushed Stone Association is to be congratulated for the splendid, able and capable work that our president is doing for the organization at the present time. And again I would like to say that the securing of Mr. Goldbeck for the establishment of the Research Bureau was, to my mind, one of the most advanced moves the National Crushed Stone Association could have made. Mr. Goldbeck is recognized as one of the foremost men in research work, and personally I have found him a great help to the stone producers throughout New England.

F. T. GUCKER (Philadelphia, Penn.): I think conditions in eastern Pennsylvania in 1927 will be about as they were in 1926.

Eastern Ohio and Western Pennsylvania

M. Z. BENTLEY (Report of J. C. King, director, representing the territory comprised of the counties in eastern Ohio and western Pennsylvania): Business in 1926 was generally fair, although not so good as 1925. Prices eased considerably and there was keen competition among some producers for what roadstone was flowing. Prices became easier, resulting in loss of money and the financial embarrassment of one or two small concerns.

Nineteen hundred and twenty-seven promises to be equally as good if not better than previous years. The steel industry looks forward to good business, at least over the first half, which will result in a strong demand for blast furnace stone. The amount of money which will be available for new construction of roads will be less than in 1926, but funds available for maintenance will be more owing to the increased revenues from gasoline and license tags. Prices on all road building material have a tendency to stiffen at the present time and it is believed that a better average price will be maaintained throughout the year.

Parts of Illinois and Tennessee

E. J. KRAUSE (St. Louis, Mo.): Territory of central and southern Illinois, central and western Tennessee: It is a pleasure to report a greatly improved spirit of co-operation among the producers in our district due no doubt to the contact we have through the national as well as the local associations.

The outlook in central and southern Illinois for 1927 is bright. The road program will go forward on a larger basis than 1926. Agricultural limestone will doubtless move in larger volume than 1926, which promised to exceed 1925, but was held down by excessive rains during the season in which the demand was heaviest. I refer to agricultural limestone, as Illinois uses approximately one-quarter of the total consumption in the United States.

There will be a large municipal construction program in St. Louis. There is, however, more acute competition with gravel in this territory.

Mid-West Territory

F. C. MURPHY (Chicago, Ill.): During the year 1926, in the territory comprising the states of Illinois, Michigan and Indiana, and into which states the producers, who are members of the Mid-West Division of the National Crushed Stone Association, ship at least 90% of their tonnage, the volume of business has been, according to reports received, nearly equal to that of 1925, but a definite decrease in price is shown amounting to from five to ten cents per ton.

In the state of Illinois, owing to a heavy curtailment of the state highway department's program, the tonnage of crushed stone used in road building was considerably less than in the years 1922, 1923, 1924 and 1925.

The prospect for business in 1927 is particularly good in the territory referred to in this report.

The state of Illinois proposes to let 1,000 miles of road on the new $100,000,000 bond issue system, and as evidence that this proposal will be carried out there is being let today, January 17, at the state highway department, Springfield, approximately 150 miles.

In and about Chicago plans for widening all main highways leading into the city, from eighteen feet to thirty feet, are in advance stages, and this work will be under construction this year, while Cook county has recently passed a bond issue for the expenditure of $15,000,000 for secondary county roads.

A conservative survey of the situation would indicate that 1927 should be a particularly good year for the stone industry, and there are also at the present time definite indications that the prices will go back to the level in effect during 1923 and 1924.

W. R. SANBORN (Kankakee, Ill.): My report must necessarily be very much along the same lines as the reports of Colonel Chamberlain, Mr. Krause and Mr. Murphy, being in practically that same territory.

I believe Mr. Murphy omitted one important feature from his report, which concerns the prospective output for the state of Illinois for the coming year. We have not, in many recent years, had any large addition to our production, but we are to have a big new crushing plant in southern Illinois at a point near East St. Louis this coming year, and Mr. Murphy is to take charge of the activities. Inasmuch as this is a big plant, I feel it is a very important factor in Illinois.

Our state highway department has resumed its activities and that always is a welcome feature for us.

I believe anything else I would have to say would simply be a repetition.

Outlook for Eastern States

JOHN RICE (Easton, Pa.): In response to the request of the president as to business conditions, past, present and future, I report as follows:

Past. During 1926 in eastern Massachusetts, western New York and eastern Pennsylvania business was better than normal throughout the year. In southern New Jersey and Maryland we felt somewhat the influence and competition of gravel, and in Delaware of slag, although we do not believe the latter competition will be serious over any great length of time.

Present. We are still operating three plants, two in eastern Pennsylvania and one in Maryland, which is a rather unusual situation at this time of year, and ran rather late in the season at two other plants for deliveries to the Pennsylvania highway department to accommodate their desire to stock up ¾-in. stone for early spring repairs.

Future. As far as I have information at so early a date in the year, the outlook

will be at least equal to last year, which was unusually good, so far as our experience was concerned. On the whole, I think we can rest assured that 1927 will prove quite a satisfactory business year. A summary of the combined reports of the railroad companies for the middle Atlantic states was most reassuring and emphasized the fact that there would be, so far as they could now forecast, no recession of business for the first half of the year. With this expectation of general business conditions, it is fair to assume that the railroad ballasting program is universally promising throughout the territories to which I have already referred. I understand New York state is contemplating a $300,000,000 bond issue, which gives promise to continue business for some time to come in the way of highway construction. The reports of general business conditions submitted by practically all industries at the meeting of the Atlantic States Shippers Advisory Board in Baltimore last Thursday, the thirteenth, indicated a general expectation of continued healthy business conditions, the majority showing slight increases, a few showing some recession.

New York State

W. L. SPORBORG (Syracuse, N. Y.): Recording for the state of New York, the year of 1926 was one where the producers generally experienced a slight increase in their volume of business, and so far as I know had a satisfactory margin of profit on their activities.

The unfavorable weather had the effect of increasing the cost of production, but not materially lessening the total volume of their output.

The year 1927 appears to be one in which we may reasonably expect a reasonable increase in our volume of business, and we see no reason to expect any change in the price level.

The transportation service has been, and presumably will continue to be, adequate—in fact, excellent, and we hope for an increase in our total tonnage and an increase in our margin of profit.

PRESIDENT GRAVES: Mr. Stirling Tomkins is not with us, due to the very recent sale of the Tomkins Cove Co. to the New York Trap Rock.

The New York Trap Rock has never been a member of this association and therefore it is very pleasing to know that in purchasing the Tomkins Cove company they have also intentionally and with advice to us purchased thereby the memberships of the Tomkins Cove company in this association and ask that they be permitted to bear their part in the work which we are endeavoring to do.

Colonel Tyler of Kentucky is unable to stand the rigors of the northern winters and is in Florida. He has sent an ambassador in his place.

Riley Wilson of Kentucky, whom it will be the delight and pleasure of all of you to know during the four days, will be with us. I commend him particularly to your good graces. I have not met him myself, but I am sure I join with you in wanting to know him as soon as we may.

California

JEFFREY WILSON (Watsonville, Calif.): Although our territory is rather large, we are most familiar with conditions in southern California, so our report will cover that only.

With only stern self-repression have we deleted all comments on climate in this report.

In discussing the present and the future conditions of the crushed stone and sand business in central California, we must look to a post-war building boom to supply reason for our present over-production. During this boom, construction of numerous rock, sand and gravel plants was begun, many of which were finished at the time when the volume of building and other forms of construction was decreasing. At the present time central California stone and gravel plants have a capacity of about 200% of our normal requirements.

The year 1926 has been a fairly good year for crushed stone, although the market has been in an extremely unsettled condition. One contributing factor is the lack of funds for the California highway commission to finance new construction. The two-cent gasoline tax now in effect is divided by law, half being apportioned to the counties and half to the state to be used only for reconstruction and maintenance of existing state highways. The proposition put before the voters to increase this gas tax one cent failed, and we hope that the legislature now in session will do something to finance new highway construction.

The present outlook for 1927 is conservatively optimistic as far as volume of business is concerned, although the price received by the producer for his materials probably will be low. More care is going to be exercised in financing buildings and privately bonded enterprises, as material men are no longer content to have their bills paid in heavily discounted bonds instead of cash. Trade associations are becoming more active in an endeavor to impress upon their members the necessity for fair and stable prices.

We expect to see the efficient organizations make money, the average organizations to lose money, and the organizations below average efficiency to go broke during 1927, because the volume of business will not be sufficient to keep everyone busy.

To sum up the situation in a few words, "1927 will reward the fighters."

From Texas

W. F. WISE (San Antonio, Texas): Texas and Oklahoma. Conditions as regards stone producers in Texas and Oklahoma for the past several years have been slightly below normal.

The railroads, having enjoyed a good business, have ordered more ballast. Building in our larger cities has been good, but our friends the gravel people have been able to get most of it. Owing to rather unfavorable political conditions at Austin, the road business in Texas has been poor. Slight movement is noticeable in agricultural lime.

The crushed stone tonnage of Texas, of all other than railroad owned quarries, is about 95% represented in this association. In Oklahoma we have only two member firms. We have had enough labor at all times except during sixty days cotton picking time, when our operations were restricted. Several of our plants have been electrified and enlarged this year. Car service has been very good.

The southwest division of the National Crushed Stone Association has been organized and held five meetings. Our engineer manager has been able to help our general standing. Our producers feel better toward each other.

We anticipate for 1927 a slight increase in railroad business, due to a rather extensive building program; considerable increase in road business, and some increase in both building and agricultural lime.

Our labor condition should remain the same as last year unless relations with Mexico should cause the Mexican labor to become restless. Railroad service should remain good. The engineers in our district feel more kindly toward our product.

Our need is more research work to prove the superior quality of the finished product' made with crushed aggregate, better quarry supervision, more modern methods and equipment and better salesmanship in our own firms, backed by a better prepared product to sell.

Minnesota Conditions

MR. SCHROEDER (Minnesota): Conditions in our Minnesota district were not up to normal as a whole in 1926. The demand for aggregate was far below normal, which seems to have had a tendency to make prices considerably lower than in previous years.

At the present time it appears as though 1927 will improve conditions. Minnesota is contemplating a $40,000,000 bond issue for good roads, and even though the state doesn't carry out this program, most of the counties will do considerable paving, and it appears as though commercial building is coming back to normal. This, together with the state program, should make a much larger tonnage and tend to stabilize prices.

It seems as though we reached our low point in 1926 and we will have a much improved condition in 1927.

Manufacturers' Division

M. B. GARBER (Orrville, Ohio), (chairman of Manufacturers' Division): This is the fifth anniversary of the Manufacturers' Division of the National Crushed Stone Association. It was founded in Chicago in 1922 by about a dozen manufacturers' representatives gathered together by N. S. Greensfelder of the Hercules Powder Co., the first and able chairman for two years, at the invitation of Scott Eames, president of the association that year. The associate members now number 80 firms. Fifty of these firms are represented in this, the fourth exhibition, which is the largest not only as to the number of exhibitors, but by far the largest as regards the amount of floor space occupied and the revenue produced.

Nineteen hundred and twenty-six has been somewhat of a transitional year for the Manufacturers' Division. Instead of being a separate group working along independent lines as in former years, it has been welded into the parent association in order to facilitate the accomplishment of one common end, and that the promotion of the crushed stone industry. This has been done in such a manner that the identity of neither the active body nor the associate body has diminished. One secretary serves both groups and there is a common treasury. The Manufacturers' Division have their own chairman and directors. They are also honored with three representatives on the board of directors of the association, one of whom is the chairman of the division.

At the annual pre-convention dinner in New York in 1925 the manufacturers voted to suggest to the parent associa-

tion that their dues be increased from $50 per year to $100 per year in order to show their willingness to do their part in the meeting of a very much larger budget that was necessitated by the establishing of the Bureau of Engineering. This increase in annual dues may have been in itself a test of the value of the association to individual firms, and the fact that there are more associate members now than a year ago seems to prove that the associate membership is on a sounder basis than before. Furthermore, the revenue produced thereby, which has been more than doubled, has been of very material assistance to the association in the financing of their new program.

Last year during the convention at Montreal the Manufacturers' Division presented resolutions to the board of directors of the National Crushed Stone Association which in brief suggested that the next convention be held at a centrally located city; that the active members be encouraged to bring their operating men and superintendents to the convention, and that special arrangements on the program should be made for these operating men. It is indeed gratfying that these suggestions met with such whole-hearted approval and it is, if you please, further evidence of the spirit of co-operation and good fellowship that has always prevailed in this association.

The annual pre-convention dinner of the Manufacturers' Division at the Hotel Commodore, New York, October 15, 1926, at which plans for the present convention were discussed, was attended by fifty-one representatives of associate member firms and the executive committee of the National Crushed Stone Association. This was the most largely attended pre-convention dinner ever held and proved that interest and enthusiasm in the association are increasing.

Research Engineer's Report Shows Where Progress Lies

THE director of the Bureau of Engineering, **A. T. Goldbeck,** in presenting his report, said that he had thought it important to show what had been brought out so as to indicate "where progress lies in the crushed stone industry." To this end he reviewed some of the problems of the producer and user of crushed stone and discussed what might be done about them in the light of our present information.

Concrete Aggregate

He pointed out first that crushed stone is the most expensive of all concrete aggregates and to bring a profitable price it must justify its increased cost by superior value to the producer. It must not merely pass specifications; it must be the best material economically producible within specification limits. Continuing, he said:

Crushed Stone for Concrete Roads. There is one outstanding quality that road concrete should possess and that is uniformity. Should the grading of the aggregate vary, the concrete will not be uniform, and that is one reason why plants producing aggregates commercially are best able to supply the kind of aggregate most desired for concrete roads, and why, on the other hand, aggregates produced by temporary plants with inadequate equipment and without any attempt at uniformity of product fail so miserably in producing good results. Progress in the crushed stone industry will require untiring efforts by all producers to do all in their power to have their stone run uniformly in grading and quality in every batch of concrete.

I am well aware that segregation of size is inevitable with almost every handling operation, but this must not be accepted as final without a strenuous attempt to overcome this evil. Graded stone falling in a single stream undoubtedly separates to some extent, so that the coarse material runs to the outside. When cars are loaded from a single, central spout, naturally a zone of fine material is produced along the central portion of the car, and the outside portion is deficient in fines. The simple expedient of dividing the stream so that it falls into the car in several streams has already been suggested as a possible means for at least partially correcting this difficulty. There are still other schemes of almost equal simplicity that should at least be given a trial. Again, when the car is unloaded and stock-piled by "coning," very bad segregation takes place and the stone producer is severely penalized by this inexcusable practice on the part of the contractor. The producer should make a point of insisting that his material be stock-piled in the proper way to prevent segregation. Stock-piling in shallow, horizontal, superimposed layers should be insisted upon and the formation of a stock pile by dumping the material in the center, thus building up a cone, should by all means be discouraged.

Attention is called to the suggestion which has frequently been heard and which recently has come into practice—that of shipping the stone in at least two sizes to be later combined at the job in the proper proportions. From the producers' standpoint it would simplify production and eliminate trouble from segregation. On the other hand, more space would be required for the extra stock pile, and the expense of handling would be greater. In other words, there might be greater expense to the contractor which would be reflected in his bid price. This would be offset to some extent by the higher yield of concrete obtainable due to the possibility of better grading and by greater uniformity in strength which should result in more economical future road design. This possibility deserves more and earnest study.

Grading for Highest Yield

Grading of Stone for Highest Yield of Concrete and Greatest Workability. The contractor will welcome stone graded in such a manner that the concrete will be easily handled, worked into place, and finished. He wants workable and not harsh working concrete. Also, he would welcome stone graded in such a way that the highest volume of concrete will result for a given amount of cement. The engineer also would like stone of this grading, for a much smoother job will be obtained. Moreover, stone graded to suit the requirements of high concrete yield and workability is also generally best graded for strength. Not a great deal of study has been given to the question of the best grading of stone for use in concrete, and much good should come from properly conducted tests along this line. I feel that it would pay the crushed stone industry manyfold if they would enter earnestly and intensively into such investigations.

Proper Tests for Concrete Road Concrete. It has been pointed out a number of times that when concrete roads fail, almost invariably failure is due to the lack of cross-breaking strength of the concrete and not to its lack of compressive resistance. The quality of road concrete should therefore be judged by its resistance to a test which will cause the concrete to fail in tension rather than compression, and the cross-breaking test is a test of that character.

Tests That Show Advantages of Stone

Crushed stone producers should be concerned in seeing that concrete for concrete roads is tested by the cross-breaking or beam test rather than by the compression test, primarily because it is the logical test for this purpose. Moreover, it is one which is much more likely to demonstrate the beneficial effects of the mechanical bond of the rough surface of stone aggregate with the mortar. Information is badly needed on the influence which the surface texture of aggregates has on the cross-breaking strength of concrete, and much investigational work should be done along this line.

Repeated Loads on Concrete. Concrete roads are subjected to hundreds of thousands of repetitions of tensile stress in the course of one year, and it is not unreasonable that the characteristics of the aggregates will have a great deal of influence on the resistance of concrete subjected to repeated loads. Repeated load investigations would throw light on the question of proper concrete road design, depending upon the characteristics of the aggregate.

Stone Dust. In connection with the question of the bond between the stone and the mortar, there is one phase of crushed stone production which has given a number of producers a great deal of trouble during the past, and that is the question of the effect of a coating of stone dust. Many cars have been rejected during the past year because the stone either contained dust or had a coating of dust. The contention of some engineers has been that the presence of a film of dust might be harmful, due to possible destruction of the bond between the stone and the mortar and to the possibility of the dust rising to the surface during the finishing operation, thus causing a weak surface layer subject to scaling under the action of traffic and frost. Other engineers just as strongly and honestly believe such contentions are erroneous, especially in these days of relatively dry, plastic mixes free from excess water. Producers should be fortified with definite knowledge on this point. It is a vital one which cannot be ignored and which cannot be settled by argument and contention. Your production methods in the future, in part at least, are involved with the dust question, and that is why it is so important that we be forearmed with definite knowledge so that we might proceed intelligently. In the meantime some of your troubles will be avoided by doing your utmost to keep the dust down to a low percentage.

Progress for the producers who are supplying aggregates for concrete road construction would seem to lie, therefore:

1. In their making an effort to produce aggregates graded to promote the highest yield and highest workability.

2. To produce aggregates as clean as possible from a commercial standpoint.

3. To lend their support to the conduct of investigations aimed at:

a. Throwing light on the question of proper gradation.

b. Obtaining more information on those factors leading to the highest cross-breaking strength.

c. Investigations on the effect of repeated loads on concrete beams.

d. Investigations on the effect of stone dust.

The matter of supplying stone in separate sizes to be later combined in the proper proportions for concrete should also be given careful thought, as this is a matter which shows signs of activity at the present time.

Flexible Types of Roads

In connection with roads of the flexible type, including macadam and bituminous concrete, our progress seems to lie in studies which have now been instituted to improve the usefulness of these types. There is no question that roads of the flexible type have demonstrated their usefulness, particularly where care has been taken to provide good subgrade support and where careful attention has been given to the essential details of construction. It is felt, however, that investigations will disclose a means for making these types even more satisfactory than they are at present, and your support is needed to lend encouragement to these investigations for their improvement.

Developments which are of rather recent origin in maintenance of secondary roads should also be of interest to you. The so-called "salting down" method of dry maintenance of earth roads is one practiced where large mileages of secondary roads must be maintained as the more durable types are being built. Such a surfacing is a vast improvement over the ordinary earth road and should furnish an outlet for small size stone, particularly for use on lightly traveled roads. The so-called "retread" method of construction is also an important maintenance measure. Excellent riding surfaces are obtained and the result in general is highly satisfactory. Both of these maintenance measures should furnish a good outlet for smaller size material.

There are a number of problems in bituminous macadam construction which remain to be solved in addition to the matter of cross-section design. One of these involves the determination of the proper size of stone to use for maximum stability of the surface course. It has been claimed, for instance, that stone from 2 to 3 in. in size gives better results than stone from 1½ to 2½ in. Again, the maximum size of stone in the base and the proper construction of the base furnishes room for investigation. Stone as large as 6 in. in diameter is being successfully used in macadam base construction. Surely progress of the industry lies in ascertaining the facts which will make for the improvement of roads of the flexible type as well as improvement in concrete roads. Progress here lies:

1. In the development of the bituminous type to render it even more suitable for present-day needs.

2. In case to supply uniformly graded and clean materials.

Building Construction. Stone for building construction in some cases has suffered in its competition with other aggregates. This in part has been due to the failure of engineers to recognize a very important principle in concrete proportioning. It has been the custom, and still is to a very considerable extent, to arbitrarily specify the proportions for concrete; and, consequently, when the sand is wet and the proportions are stated by volume, far too little sand enters the mixture and a hard working concrete results, difficult to place in the forms and hard to get free from a honeycombed surface. There is absolutely no reason why crushed stone should not always be entirely suitable from the standpoint of workability. Stone producers can do their part by paying careful attention to the grading of the stone and also by insisting that the engineer recognize the phenomenon of the bulking of sand due to moisture, so that sufficient sand will be used to produce a workable mix.

The fire protective features of most types of crushed stone aggregate have not been emphasized sufficiently by producers in their competition with other aggregates. A discussion of this subject has already been given in the September, 1926, issue of *The Crushed Stone Journal,* and a full discussion of it is to be found in the report of the Committee on Fire Resistance of Concrete of the American Concrete Institute, published in its 1925 proceedings.

In building construction immediate progress for stone producers lies:

1. In producing uniformly well graded stone for the highest yield and workability of concrete.

2. Insisting upon proper concrete proportions which will insure the use of sufficient sand in the concrete mixture so that the concrete will be workable and easily finished.

3. Emphasis on the superior fire protective nature of most crushed stone aggregates.

Concrete Units. Tests have shown that stone screenings rank among the highest for producing concrete products of very high grade, and this fact having been demonstrated, there remain to be developed new uses for concrete products. As an illustration of a new use for concrete blocks, there might be cited a development noted in Salt Lake City. Here concrete slabs approximately 4 ft. long by 1½ ft. wide and 4 in. thick are laid longitudinally on each side of the street car tracks. Apparently they are entirely satisfactory and are eliminating the roughness which develops adjacent to car tracks when other types of pavements are used.

Necessity for Studying Producing Methods. Engineers invariably specify the size of stone in accordance with laboratory screens supplied with square or with circular openings. It would seem necessary, then, that every plant be equipped with laboratory screens, and it should be the duty of some one individual to keep a continuous check on the size and quantity of material of the various sizes being produced. The frequency of testing will, of course, be governed by circumstances, but sufficiently frequent testing should be performed so that the producer will have full information on the gradation of his product stated in terms having significance to the user, in terms of laboratory screens.

A study of your product in an effort to improve it should be a continuous process. Oftentimes through a slight change in the method of manufacture a much more suitable stone might be produced, perhaps by the elimination of more of the dust, perhaps by production of more satisfactory grading. An improvement in the now seemingly impossible might even be accomplished, namely, the elimination of segregation. I am firmly convinced that, by and large, higher and higher quality must inevitably result in that greater usefulness which will insure progress for the crushed stone industry.

Necessity for Obtaining Facts. There are many facts to be learned in connection with the characteristics of crushed stone before definite steps can be taken to develop its field of usefulness. A few of the questions involved in your progress have already been mentioned, and there are a great many more of equal importance to the industry which can be solved only through the performance of proper investigations.

To my mind, the whole matter might be summed up in the statement that your entire progress is in your own hands. It depends upon your development of the usefulness of your material on a quality basis, and that development, in large measure, must be founded upon facts which you, in part, can discover in connection with your own production and which, in part, must result from systematic investigations conducted for the industry as a whole. Other industries have had their usefulness and their progress considerably enhanced through systematic study and investigational methods and there is every reason to believe that the crushed stone industry will find such methods of corresponding value.

Reports of Committees

THE report of the Committee on Standards was presented by Col. O. P. Chamberlain, chairman, who gave an excellent review of the work of the committee and the ground covered by it.

The three sub-committees of the Committee on Standards presented reports that showed that considerable progress is being made in establishing standards for the industry. The work of the committee on standardized sizes of crushed stone has perhaps the widest interest. Its report shows that a great deal of work has been done and much study given to the subject. However, it did not feel justified in making more than a progress report.

Sub-Committee on Standardization of Drilling Equipment

The commitee on standardization of drilling equipment, Fred A. Gill, of the Gill Rock Drill Co., chairman, reported that manufacturers had now received the templates necessary to make tools in conformity with the standards adopted at the Montreal convention. It is now the duty of the membership to see that the association's work in establishing standards be made of full value, and the committee urged that members specify and insist upon tools of the sizes and design recommended by the committee.

Report of Sub-Committee on Quarry Tracks and Cars

The following contains the main facts from the report of the sub-committee on quarry tracks and cars:

"W. E. Farrell (Easton Car and Construction Co., Easton, Penn.), chairman of the

Sub-Committee for the Standardization of Quarry Tracks and Cars, with his sub-committee, sent out 187 questionnaires and received a considerable number of replies.

"As a result of the investigation of this sub-committee the following conclusions are drawn:

"It would seem that 20-lb., 30-lb., 40-lb., 60-lb. and 70-lb. rails would answer for most quarries.

"Tie spacing of 18 in., 24 in. and 36 in. would answer all requirements. The tie spacing is independent of the weight of rail, that is, it does not vary with the weight of rail.

"Standard railroad tie spacing is 24 in. center to center of this, except at joints, where it is from 15 in. to 22 in.

"Track gages of 24 in., 36 in. and 56½ in. will answer all requirements for quarries.

"This sub-committee concludes that little can be done at present to standardize quarry cars."

Report on Standardization of Crushed Stone Sizes

In presenting its report the sub-committee on standardization of crushed stone sizes (of which W. R. Sanborn, Kankakee, Ill., is chairman) went thoroughly into the difficulties of recommending standard sizes. These come from the difficulty of satisfying the varied wants of engineers and other buyers who do not wish to change methods, and also from the inability of quarrymen to agree on definite standards.

The committee worked on the "straight line" theory which has been used by crusher manufacturers in their catalogs and is familiar to those readers of Rock Products who have read Hugo W. Weimer's articles on the design of stone crushing plants. (See Rock Products for May 29, 1926, and following.) Concerning this straight line theory the committee's report says:

"A harder or softer rock may put a twist at the top or bottom of the plotted line, but in a general way the rule applies that the 'percentage passing any screen is proportional to the size of the opening.' If that law is only approximately true, it has a most important bearing on the selection of standard sizes and standard specifications for each size, because it enables us to approximate the quantity of each size that our crushing plants will produce.

"The straight line theory would indicate the following percentages of product passing various sizes of screens:

Passing through openings of	Per cent of product
3 in.	90.0
2¼ in.	67.5
1¼ in.	37.5
⅝ in.	23.3
¼ in.	9.4

"This indicates the following percentages of each of the various sizes:

Size	Per cent
0 — ¼	9.4%
¼— ⅝	13.9%
⅝—1¼	14.2%
1¼—2¼	30.0%
2¼—4	32.5%
	100.0%

"Just how to go about the establishment of a scientific specification is something of a problem which will require the attention of many minds before it is solved correctly. It would seem reasonable that the first step should be the adoption of a mathematically graded series of primary sizes. By that I mean a series of definite advances in size. For example:

Size	Change by eighths	Variation by eighths
0	....	....
¼	2	1
⅝	3	2
1¼	5	3
2¼	8	4
3¾	12	....

"It seems essential that besides the regular maximum and minimum sizes of test screens there also be intermediates exactly midway between the standard sizes, to determine whether sizes are uniformly graded, and, if not, the permissible extent of the departure. Such odd-sized screens at first glance seem rather unusual, but the whole subject of standard sizes is revolutionary. Therefore the following test screens are proposed:

PROPOSED TEST SCREENS

Size of stone	Screens for intermediate tolerance	Screens for maximum size
0 — ¼	⅛	¼
¼— ⅝	7/16	⅝
⅝—1¼	15/16	1¼
1¼—2¼	1¾	2¼
2¼—3¾	3	3¾

"The permissible tolerance above and below the specified limits seems to be of prime importance.

"Assume for the moment that tolerance in per cent be 5, 7, 10, 13 and 20% for the suggested sizes. Finally determine the permissible or desirable variation above and below the 50% which would pass the intermediate test screen if the stone were truly uniformly graded between its two limits.

"Considering the present lack of real knowledge on the subject, arbitrarily assume a permissible variation of 25% above and 15% below the ideal 50% through the intermediate screen.

"Future research will doubtless justify a somewhat narrower variation for primary sizes and possibly a greater variation than that resulting from integrated analysis for mixtures, but for the purpose of this preliminary study, try out the suggested variation. These standard sizes conform to the analysis given in the Table of Proposed Tentative Standard Sizes:

PROPOSED TENTATIVE STANDARD SIZES OF CRUSHED STONE

Sizes of test screen	Per Cent Passing Screens and Sizes of Stone 0—¼	¼—⅝	⅝—1¼	1¼—2¼	2¼—3¾
⅛ in.	35 to 75%	.....	.....	.....	.....
¼ in.	95 to 100%	0 to 5%	.....	.....	.....
7/16 in.	100%	35 to 75%	.....	.....	.....
⅝ in.	.....	93 to 100%	0 to 7%	.....	.....
15/16 in.	.....	100%	35 to 75%	.....	.....
1¼ in.	.....	.....	90 to 100%	0 to 10%	.....
1¾ in.	.....	.....	100%	35 to 75%	.....
2¼ in.	.....	.....	.....	87 to 100%	0 to 13%
3 in.	.....	.....	.....	100%	35 to 75%
3¾ in.	.....	.....	.....	.....	80 to 100%
5 in.	.....	.....	.....	.....	100%

"Such a specification is no more objectionable than those that have been proposed, but does have the advantage of being graded by a systematic increase in each succeeding size.

"There is no particular virtue in the use of the exact sizes considered above. It might be advisable if square hole test screens are adopted to make six primary sizes, something as follows, using decimal parts of the inch rather than fractions of the inch:

Size of stone inches	Screens for intermediate tolerance inches	Screens for maximum size inches
0 —0.2	0.1	0.2
0.2—0.5	0.375	0.5
0.5—1.0	0.75	1.0
1.0—1.8	1.4	1.8
1.8—3.0	2.4	3.0
3.0—4.7	3.875	4.7

"Either of these systems would give us quarrymen a standard method of comparing the various sizes that we are selling to our customers."

Report of the Committee on Welfare and Safety

In introducing the report of the Committee on Welfare and Safety (N. S. Greensfelder, chairman) the interesting fact was brought out that accidents in quarries of portland cement plants are fewer than those of crushed stone plants. The reason ascribed is that accident prevention campaigns have been carried on for years by the Portland Cement Association with the co-operation of all its members.

At the New York meeting of the committee, held October 15, 1926, definite recommendations were agreed upon. These were:

(1) That a complete, detailed statistical study be made and issued annually covering accidents from all causes throughout the industry in order to provide an intelligent basis for directing preventive measures.

(2) That a pamphlet on Standard Safety Practises in quarries be compiled and published, that will enable each member company to place in the hands of its employees helpful recommendations for the safe conduct of every day tasks.

(3) That a safety organization be perfected at each operating plant and that elected representatives of the employees co-operate with the appointed representatives of the management through a safety committee, for the safeguarding of life and property. The National Safety Council has offered to prepare an outline, on recommended methods for organizing safety committees. Copies of this outline will be distributed to all members of the National Crushed Stone Association with the compliments of the National Safety Council.

An invitation from the U. S. Bureau of Mines to enter the national safety competition for the "Sentinels of Safety" trophy was read. The Bureau of Mines also requests members to co-operate in statistical work and says that a carbon copy of the monthly accident report that

must be furnished most state industrial commissions is sufficient as a record.

A sub-committee consisting of D. C. Souder, France Stone Co.; E. E. Evans, Whitehouse Stone Co., Oliver Bowles, United States Bureau of Mines, and W. Dean Keefer, National Safety Council, has been appointed to draft recommendations pertaining to the Safety Practises Pamphlet. This sub-committee reports that such a pamphlet could be divided as follows:

SECTION 1—Blasting: Safety practises in the use and handling of explosives and in drilling operations.

SECTION 2—Transportation: Safety practices in the loading, unloading and transporting of material at quarries including stripping, storage and reclaiming operations.

SECTION 3—Mill Operations: Safety practises in the crushing, screening, and all other operations in the mill or plant.

If it was decided to go further, another section pertaining to child labor and sanitation could be added.

The committee has approached the Bureau of Mines in the matter of giving first aid training to quarry employes and the Bureau has said it is willing to give it provided the number wishing it take such training in any locality is sufficient to justify the expense of sending the rescue car and crew to that place. The secretary of the association will send out letters to the entire membership to ascertain the facts for the Bureau.

On Wednesday, January 19, the committee held a joint meeting with the executive committee of the quarry section of the National Safety Council. It was agreed that if the recommendations of this committee now reporting were adopted the National Safety Council Committee would co-operate and co-ordinate its work to the same ends.

The report was discussed at luncheon Thursday by E. E. Evans of the Whitehouse Stone Co. and D. C. Souder of the France Stone Co., both of Toledo, Ohio.

Report of Committee on Winter Storage

The report of the Committee on Winter Storage was presented by W. R. Sanborn, chairman. It was an exceptionally good presentation of the advantages and disadvantages of winter storage not only from the producer's standpoint but from the standpoint of the contractor purchasing the stone. It was the committee's recommendation that quarrymen, engineers and contractors should get together and solve the problem for each particular locality.

Abstracts of Technical Papers

Installation of a Laboratory

ARTHUR C. AVRIL, mining engineer of the France Stone Co., made an interesting talk on the installation of the laboratory of the France Stone Co., Toledo, Ohio. A description of this laboratory has already been published by Rock Products (October 30, 1926).

An article by Mr. Avril is scheduled for early publication in this paper and will be followed by others.

Use of Crushed Stone for Sewage Disposal and Water Purification

A paper on the uses of crushed stone in sewage disposal and water purification was read by **William E. Stanley,** of Pearse, Greely and Hansen, Chicago.

Crushed stone is used in two ways in these branches of municipal engineering, as aggregate in concrete and as a filter media. The second was the use discussed by the speaker.

As filter media stone is used in:

1. Trickling or sprinkling filters.
2. Contact filters.
3. Intermittent sand filters.
4. Sludge filters.

Crushed stone forms the bed of the first two. In the third and fourth types crushed stone is used as a support and a means of draining the sand bed.

In water purification crushed stone is sometimes used as a support for a sand bed.

The use of crushed stone as a coarse-grained filter is rapidly developing. During the past year a number of contact filters have been built, although the tendency today seems to be toward other types. Trickling filters are now one of the standard elements of many plants.

Trickling filters are made of specially selected filter media and may cover from a few square feet to over 30 acres, as in Baltimore. The media may be of crushed stone, crushed gravel or crushed slag. The sewage trickles down through the bed and dissolved organic material is oxidized to stable mineral products in the passage. The speaker showed slides to illustrate the construction of trickling filters.

The material used for a media must be of the right size to provide surface for bacterial action and at the same time the filter must not clog. The material must not disintegrate from action of the weather or the sewage, and the surface must be neither too smooth nor too rough.

As examples: The Worcester, Mass., filter, covering 14 acres, 10 in. deep, is of crushed granite and trap rock, sizes from 1 in. to 3 in. At Madison, Wis., crushed limestone from ¼ in. to ¾ in. has been used for the top 18 in. of the filter bed with good success. But experience seems to point to stone from 1 in. to 2½ in. for the upper section. It is important that there be no large amount of fine material and that the greater part be of uniform size. The filter at Akron, Ohio, now under construction, comprises 14 acres 10 ft. deep and contains 223,000 cu. yd. of crushed stone. Mr. Stanley gave the specifications for this, which have already been published in Rock Products.

Where trap granite and quartzite rocks are available the determination of soundness does not seem to be so important. With limestones care has to be taken to choose only those that are proof against disintegration. The results of a filter census showed that limestone had been used in 46% of trickling filter plants located by the census and 51% of these showed deterioration of the filter medium.

Engineers are providing against deterioration by specifications that call for: Hardness, not less than 14%; toughness, not less than 5%; wear, not more than 6%. There must be no sign of checking or disintegration from the application of the sodium sulphate test.

Crushed stone must be prepared for filters with much more care than for other uses. The permitted tolerance in sizes is much less and there must be no coating of dust. It is often necessary to rescreen at the filter site, and sometimes to wash the stone. At Elgin, Ill., rescreening and washing 20,000 yd. cost $3,000. In Akron bids showed an additional cost of 20c per ton for rescreening.

A recent census of filters put in tabular form was given. The total showed that 388 trickling filters in the United States served 4,032,500 population. These filters contained 1,388,900 yd. of filter media as follows: Limestone, 583,300 yd.; trap rock, granite, quartzite and flint, 534,300 yd.; crushed gravel, 28,100 yd.; crushed slag, 10,500 yd.; cinders, 194,000 yd.; miscellaneous, 18,700 yd.

Sizes of Stone

Two papers of such importance that they should be published later in full related to plant products. These were "Stone Dust," by **W. M. Weigel,** formerly mineral technologist, Bureau of Mines, and now with the Missouri Pacific Railway, and "Commercial Sizes of Broken Stone," by **F. H. Jackson,** of the Bureau of Public Roads.

Mr. Weigel's paper discussed the whole field of stone dust, including agricultural limestone. The silicate rocks do not serve as a source of stone dust, but a small amount is unavoidably produced in crushing. The only output would seem to be for their use as abrasives, and abrasives offer a very limited market.

Limestone and marble dusts are used for agricultural limestone, rock dusting in coal mines, asphalt filler and stock feeding, all in comparatively coarse sizes. In fine sizes they are used for fillers in many industries. Each of these uses was discussed, the greatest attention being paid to agricultural limestone. An especially valuable part of the paper was a table of prices of agricultural limestone in different states. The average selling price was $1.42 per ton.

Rock dusting for coal mines is now known to be a positive preventive of dust explosions and its use is increasing. Speci-

fications have not yet been drawn, but tentative specifications have been proposed by the Bureau of Mines. Commenting on this one member said that the mines he furnished said the specifications called for too coarse a product and they were now using regular asphalt filler.

Asphalt filler production was shown to amount to 500,000 tons annually. Slate dust is used, but limestone dust is the most commonly used.

Of high-grade limestone dusts over 90% are used in the rubber, paint, putty, linoleum and kalsomine industries. The speaker gave the requirements for each of these. Ceramic whiting is a use in which the chemical analysis is most important, a very low iron content being imperative. The same is true of limestone used in glass making. A fairly coarse product is needed by the glass makers; all passing 6 mesh and retained on 30 mesh is the ideal.

A great many prices obtained for high-grade dusts were quoted, also for dust for coal mines and for agricultural use and filler.

The discussion of production methods was very thorough and included not only the types of machines but some figures of operating cost.

Commercial Sizes of Crushed Stone

In discussing commercial sizes of crushed stone, **F. H. Jackson,** who is chairman of the committee of the American Society of Testing Materials on standardization of sizes, showed that the multiplicity of sizes came from development of various bituminous types of road. On 27 roads it was found that 10 different sizes of stone were used in the penetration course alone. Specifications for stone chips showed such variations as 3/16 in. to 5/16 in., ¼ in. to ½ in., and 5/16 in. to ½ in. It is obvious that so many sizes are unnecessary, but the engineer who is responsible likes to stick to the material that has given him good service.

The committee of the A. S. T. M. having this subject to consider has struggled with it for some time, trying to sift out sizes until only the most used remained. The Bureau of Public Roads had gone into the matter pretty thoroughly, making a survey of 100 plants. The number, type, dimensions, speed and other features of the screens in each plant were tabulated. Samples were taken of the product of each screen for a screen analysis in the laboratory. It was found:

1. The length of the revolving screen greatly affects the grading of the product.
2. Pitch and speed do not affect it.
3. The effect of oversize holes (from wearing) is practically negligible. The speaker said he expected this to be disputed, but it was the only conclusion that could be drawn from the bureau's survey.

The presence of small amounts of oversize and undersize is generally due to leaks in chutes and bins.

It is impossible, as these tests show, to specify a product as one made by passing a certain sized plant screen and being retained on another plant screen. The best way to specify is to use laboratory screens and permit a reasonable tolerance for oversize and undersize. Five per cent was suggested for oversize and 15% for undersize, but this tolerance was suggested for the larger, or primary, sizes only. The method of specifying should not tell the producer what screen he should use. The product should be specified and the screen left to his judgment.

The sizes taken should be such that their sum should equal the product of the plant and there should be no overlapping of sizes.

A satisfactory method of measuring should be decided upon. The concrete people want square holes and the bituminous people want round holes in testing screens.

Mr. Jackson gave the following five standard sizes, suggested to the A. S. T. M. committee:

0 in. to ¼ in.
¼ in. to ¾ in.
¾ in. to 1¼ in.
1¼ in. to 2½ in.
2½ in. to 3½ in.

with tolerances of 5% and 15%, as explained. It is hopeless to try to specify sizes that will make all products equally salable, as the variations in the market regulate salability. But three of these sizes will combine to make an ideal coarse aggregate on the assumption that straight line grading is the ideal. These are:

1¼ in. to 2½ in..... 60%
¾ in. to 1¼ in..... 25%
¼ in. to ¾ in..... 15%

This is about the proportion in which the ordinary plant produces these sizes.

There are three courses open to the association in future work on standardization of sizes. These are:

1. To work for the universal adoption of such a standard as the A. S. T. M. standard.
2. To work for its adoption with the inclusion of other sizes.
3. To abandon all idea of national standardization.

The committee of the National Crushed Stone Association can be of material service to the committee of the A. S. T. M. in its work on standardization of sizes.

Use of Crushed Stone in Cement Products

The "Use of Crushed Stone in the Manufacture of Concrete Products" was the subject of a talk by **W. D. M. Allen** of the Portland Cement Association. Mr. Allen confined his talk to the use of limestone screenings either with or without the addition of the finer sizes of crushed stone for making building units, concrete block and tile. He showed that these alone presented a considerable market for aggregate, as the 700,000,000 block made last year required 250,000 carloads of aggregate to make.

Some crushed stone producers make cement products while others find it better to sell stone to manufacturers, this being a problem which is best solved by the producers' conditions. The speaker was particularly interested in limestone screenings such that about 5% would remain on a ¼-in. screen and 5 to 20% would pass 100-mesh. Such screenings could be mixed half and half with fine sizes of crushed stone or half and half with coarse torpedo sand to make an excellent aggregate. The light color which the screenings give to blocks is often a considerable advantage in selling, light colored blocks having a preference in the market for some unknown reason.

Screenings make a more workable mix than other aggregates at the water cement ratio ordinarly used for tamped blocks. In plastic concrete there is a tendency for the finer dust to segregate and be floated to the top, but this tendency does not exist with the so-called "semi-wet" mixes used for tamped units. A much larger amount of minus 100-mesh material can be used in blocks than could be used in mass concrete.

The speaker recommended a longer time of mix with screenings than with ordinary aggregates—at least five minutes. This, he said, was no hardship to the block manufacturer and in some cases manufacturers had gone so far as to install double mixers, one in which to mix the materials five minutes dry and a second in which to mix five minutes with water.

With screenings the danger of a short mix was that the fine dust might "ball" in the mixer.

The tampers compress better where there are plenty of fines in the mix. There is less danger of the webs and corners breaking off. In fact, there is a distinct need for "fat" aggregates in the products industry. If producers will inform themselves about the needs of the block maker and show him how he can make a more plastic material a market for screenings of considerable importance may be developed. Harsh mixtures mean the loss of block through the breaking of corners and it also costs more to handle such block in such a way that they are not liable to break.

The same effect may be had by using more cement, but limestone screenings are much cheaper than cement.

In closing Mr. Allen spoke of the improvement in both organization and equipment that is going on in the industry. The hand machine is almost out of use. The companies going into the business are made up of men with capital accustomed to handle production on a good sized scale. Recently large combinations have been formed from manufacturers in Detroit and Pittsburgh with capitalizations around $1,000,000. This

shows that the industry is getting into strong hands.

Where 16 to 18 blocks per sack of cement was formerly considered a good yield, 22 to 24 blocks are now made. This has been brought about by studying the grading of the aggregate. The Portland Cement Association has done much to bring about such results, believing that the best way to insure the position of concrete building units in the market is by reducing the unit cost as much as possible.

Mr. Allen was asked several questions about central mixing plants. He said that a central mixing plant was largely a merchandizing proposition. There was no doubt but that it produced concrete superior to that ordinarily mixed, but the organization to "put it across" had to be formed and maintained. One necessary matter was to keep the consistency such that the slump was not more than 4 in. to avoid the danger of segregation. If this were done concrete could be hauled 15 or 20 miles over good roads.

Answering a question about the use of accelerators in concrete products, Mr. Allen said the need for these had been obviated by steam curing. Steam curing for 48 hours at 100 deg. will ordinarily render the block hard enough to be safely handled.

Research Work of the U. S. Bureau of Mines

Dr. Oliver Bowles, superintendent, U. S. Bureau of Mines Experimental Station, New Brunswick, N. J., described the work of his station in some detail. He said he believed there was much practice in other industries that could find application in the quarry industry. One work now under way is a study of limestones used for metallurgical purposes—particularly blast furnace flux—which amounts to 25,000,000 tons a year.

Dr. Bowles also said a part of the Bureau of Mines work was to assist in accident prevention and safety work. For this end producers were urged to furnish adequate statistics.

Agstone Problems Discussed

The National Agstone Association group luncheon was only one of the few which had a set program, including papers. President Poorman of the association first introduced **J. R. Bent** of the Illinois Agricultural Association, who spoke on "Marketing Agstone in Illinois."

Illinois Marketing Methods

Mr. Bent began at the beginning by showing the supreme importance of lime in civilization. Von Liebig, over a century ago, pointed out that soil fertility was the most precious resource of a nation and lime he held to be the basis of soil fertility. America has had a wonderful resource in the fertility of its soil and has spent it extravagantly. To illustrate how the cost of raising crops is increased by depleting fertility the speaker gave the following figures from Illinois Experiment Station tests:

Cost of growing corn on land on which corn has been grown for a number of years without rotation with other crops, $0.93 per bushel.

Cost of growing corn, rotating with clover, $0.53 per bushel.

Cost of growing corn when limestone and phosphate were used (including the cost of these) $0.43 per bushel.

The great loss of limestone from the land is not from cropping but from the leaching set up by cultivating the land. The loss of lime from a crop of alfalfa may be 50 to 60 lb. per acre, and the loss by leaching will be 500 to 600 lb. per acre, as Dr. Kriege showed later in his talk. It is figured that the run-off from the state of Illinois alone carries the equivalent of 2170 cars of agricultural limestone to the sea.

No hard-and-fast rule for the amount of limestone to be applied can be laid down; not only the size of the grains but the porosity and other physical characteristics affect the rate of solution of the stone.

Mr. Bent said that his interest in this meeting was that he considered it his function to smooth the path from the producer to the farmer as much as possible. In Illinois the arrangement had been made to permit the farmer who was a member of one of the 35 recognized farm bureaus to pay for his limestone by cash and a certificate good for 10c a ton issued to him on account of his membership. This was right, as the quarry was saved sales expense and the farmer had paid this when he paid his dues to the association. Orders were sent in on a standardized blank in quadruplicate. The quarryman and the farmer each had one copy and the state and the association each received a copy for statistical purposes.

The future of agricultural limestone, and especially its prospects for 1927, will depend on the financial state of mind of the farmer. He appears to be "sold" on the idea of liming but whether he will spend money for liming material or not depends on how he feels about incurring any expense.

In answer to a question as to the best size of limestone to use, Mr. Bent said that it depended on the immediate condition to be met, but in Illinois generally it had been found that the usual ¼-in. product (screenings) gave the farmer the most for his money.

Another questioner wanted to know how the chemical analysis was handled. Mr. Bent said that was rather a small matter. They were asking only that producers give the farmer reasonable quality. The important thing from the Agricultural Association's point of view was to encourage the maximum use of limestone. His idea was that the dirt should be kept out, that the product should be reasonably fine and that it should be got onto the fields as soon as possible.

Fineness and Solubility

Dr. Herbert F. Kriege, now with the France Stone Co., but formerly in charge of the research work of the National Agstone Association, spoke on the relation of fineness to solubility. He described briefly the work being carried on by the association through Ohio State University which has several times been described in Rock Products. This work is now in its fourth year and it is possible to make some interesting generalizations from the results secured.

One of these came from applying the limestone with the assumption that a grain between 48-mesh and 65-mesh would dissolve in one year (as had been previously determined by tests made in Pennsylvania). In the Ohio tests the rate was found to be much slower. It took two years for such a grain to dissolve.

The greatest neutralizing effect had been shown to be at the end of the second year. At the end of the fourth year there was a strong tendency to revert to the original condition. There was a difference in this however between the plots treated with high calcium stone and those treated with dolomitic stone. He gave the following comparisons to show this: With high calcium limestone on a field requiring 6000 lb. to neutralize the acidity, only 1100 lb. would be required at the end of the first year, but this rose to 1600 lb. at the end of the second year and to 2300 lb. at the end of the third year. With dolomite the amount required fell from 6000 lb. to 3400 lb. the first year, to 3000 lb. at the end of the second year and to 2100 lb. at the end of the third year, showing that when the high calcium stone was being exhausted the high magnesium stone was getting in its best work. Of course more rapid neutralization might have been obtained with the dolomitic, or high magnesium stone by finer pulverization.

Much of Dr. Kriege's talk had to do with purely technical matters such as the determination of the relation of surface to diameter of grains. It was shown that this relation existed with regular as well as irregular shaped grains so that the solubility *for the same stone* was in direct relation to its fineness. In the case of dolomitic stones there might be a variable rate of solubility, the high calcium crystals dissolving more rapidly than the dolomite crystals. The density or crystallinity of the rock did not seem to be a guide to solubility, some dense rocks dissolving more rapidly than softer rocks of practically the same chemical analysis. It was impossible to look at a rock and predict that it would dissolve slowly or rapidly from its appearance.

Broadcasting Advantages of Limestone to the Farmers

Frank Petty of the National Farm Radio Council spoke on the possibilities of reaching the farmer through the radio. It surprised most of his listeners to learn that the favorite time of the farmer to listen in to educational matter was the noon hour. The farmer's family uses the radio in the evening for entertainment. Mr. Petty said that while it was possible formerly to obtain free time for educational matter, stations now were charging for everything that they could and it might cost the association something to get its message out on the air. However, he advised the association to look into radio publicity as it ought to be a valuable aid to the work done through agricultural journals, farm associations and like organizations of farmers, both local and national.

Stone in Highway Construction

A NUMBER of important papers on highway construction were read, giving this important matter more than the usual amount of attention. One of the most notable was that of **C. N. Connor,** chairman of low cost road investigation, highway research board, National Research Council.

Mr. Connor showed that we have 368,000 miles of highway, of which the larger proportion is fit for a traffic of only 600 to 700 vehicles per day. They can be made part of a stage construction highway program by adding new surfacing, which is much to the interest of the crushed stone producer. Mr. Connor spoke briefly here of the problems presented by sub-grades and sub-bases to be improved before surfacing. Sub-bases of the future may be the present surfacing and in this way there is a field for the use of stone, gravel, and the like to be compacted by rolling in the more sparsely settled regions.

The surfaces with bitumen are giving satisfaction. They are more easily described than named, but there are four identified in common uses, which are:

1. Skin surface treatments, less than 1 in.
2. Mixed in place surfaces, 1 in. to 2 in.
3. Bituminous macadam, 2 in. to 3½ in.
4. Bituminous concrete, black base and sheet asphalt.

All these have bituminous binders and are of less thickness than a cement road slab because they carry the load on the sub-base and sub-grade.

Skin treatment consists of a "prime" coat and second coat of bitumen covered with sand or stone chips, and is good for 800 to 1500 cars and light trucks per day. It cost $900 to $1500 per mile for the first treatment and less for subsequent treatments.

Mixed in place surfacing is laid by cleaning the road, applying a prime coat of tar, then an asphalt coat, covering with 50 lb. per yard of stone from 1 in. to 1¼ in. and rolling. The road is then opened to traffic and gradually changes to a bituminous surface with many exposed stones. It is then given a seal coat. The coat is about $2000 per mile for 20-ft. width, and the road will carry 1500 vehicles per day satisfactorily with maintenance costs of $300 to $400 per year.

The speaker gave very detailed descriptions of how this road had been successfully used in Pennsylvania, Tennessee and other states and read specifications from these states.

Bituminous macadam is such a familiar type that it was treated briefly by the speaker, who spoke of the excellent results obtained in New England, due largely to the pains taken in its construction there. It is advisable to construct it on a stone base.

Bituminous concrete roads using crushed stone as coarse aggregate become securely keyed to surfaces composed of fine materials. Amiesite is a type that tends to become well keyed. Black base or sheet asphalt with a binder course are well adapted as surfaces on these leaner mixes. The speaker believed that a layer over the base course of penetration, black base or binder courses will improve the road. This was shown by some tests carried out in North Carolina.

In closing the speaker said that more work was needed on the design of intermediate roads and asked why these should not be as thoroughly tested as the higher types. He spoke approvingly of Mr. Goldbeck's discussion of such roads in the *National Crushed Stone Journal* and Bulletins.

The Super-Highway

Col. Sidney D. Weldon, chairman of the Detroit Rapid Transit Commission, made a very interesting talk on the "super-highways" which are being built in and around Detroit. Three counties have united on a "master plan" for highway development. Colonel Weldon's discourse was mainly on the advantage of having a master plan so that "time might become an ally instead of an enemy."

The Detroit master plan provides for main trunk line highways of 204-ft. width, main city streets of 120-ft. width, secondary streets of 86-ft. width and residence streets of 60-ft. width. Rights of way are being acquired on this basis and all subdivisions have to be laid out for such highways.

It was shown that by the end of 70 years the automobile traffic of the United States will certainly have doubled, using the most conservative estimates as a basis, and this increase must be prepared for now not only by cities but by even the smallest towns.

Lantern slides and moving picture films were shown. One of the slides showed a finished street of the 204-ft. width with central space for rapid railway transit, intersections above and below grade, and lanes for fast and slow traffic. The moving pictures compared old and new highway conditions, showing the improvement from widening roads.

Bituminous Road Construction

The remainder of the session was given to papers on bituminous type road construction. There were three of these, the first being by **R. W. Coburn,** construction engineer, Department of Public Works, Boston, Mass.

Mr. Coburn showed that the bituminous macadam road was a modern type developed in Massachusetts about 1912. The type is recommended where trap rock or other hard rock is easily obtainable. The stone must be thoroughly clean and no dirt should be allowed to fall on the road, as this interferes with penetration. It is important that the sizing be uniform. Poor work is the commonest cause of failure.

In summing up Mr. Coburn said he thought a reinforced portland cement concrete road was the best road that could be built, but he believed that the bituminous road would serve for all but the heaviest traffic and it was so much cheaper to construct that it should be built wherever conditions permitted. He gave figures of maintenance, averages for a period of years on both types of road. The difference was in favor of the concrete road slab, but the difference was not enough to offset the interest on the difference in first cost for the traffic conditions to which the road was adopted. Massachusetts is building more of this type every year.

Two Types Used in Indiana

K. E. McConnaughay, of the Hayes Construction Co., Indianapolis, Ind., told of bituminous road construction in Indiana, where one of the principal problems is the maintenance and improvement of Indiana's once famous gravel roads. Some of these have had to be improved to stand an increased traffic density and the method worked out for this is known as putting on a "retread." The old road is first smoothed off and put in condition to serve as a base. On this a layer of broken stone, ¼-in. to ¾-in. is placed. This is graded and a sprinkling of cut-back asphalt is applied. The coated stone is then turned over with the grader and brought into the center from both sides to form a windrow in the center of the road. Afterward it is brought out on the grade and worked to contour and then rolled. The work has to be carefully done to conform to a template.

The black base road, Mr. McConnaughay

said, was formerly sold as a secondary road, but now is sold as a first-class road. In making it the old gravel road is first prepared to reduce capillarity and then the base is laid. Stone 2-in. to 4-in. is used in the base course to prevent ravelling. The key stone course is of stone from ¾-in. to 1½-in. Stone from ½-in. to 1¼-in. is used for covering. Both tar and asphalt are used. The tar is a heavy grade and the asphalt is "80 to 95 penetration." The road is carefully built to template and tested with a straight edge.

George E. Martin, consulting engineer of the Barrett Co., New York City, discussed these papers and pointed out that the system of retreading was much the same as had been used in Wisconsin, Pennsylvania and Tennessee. He advocating using ¾-in. stone to a depth of 2 in. and rolling well. This is really a system of maintenance. Black base has the additional advantage of keeping out any water which might be drawn to the top by capillarity.

G. H. Henderson, chief engineer of the State Board of Public Roads, Rhode Island, was scheduled for a paper on "Bituminous Macadam Construction." This paper will be printed, but as the time left before the lunch hour was very short, Mr. Henderson gave only a brief talk on the general subject of highway building.

The Value of Highway Transport Survey

G. F. Schlesinger, director of highways and public works for Ohio, in presenting his paper, "The Value of a Transport Survey," said it was a fair question for the public to ask, whether or not it got its money back from a highway survey. That which has just been completed in Ohio cost about $150,000—no inconsiderable sum.

He concluded that such a survey was worth all it cost and a great deal more, if it were made use of. One of the great wastes of government has been the cost of collecting data of which no after use was made, and much of this was of real importance. However, the interest in highways is so great today that there is not much likelihood of survey data being neglected.

The survey helps in forecasting future traffic, in properly locating the highways of a system, in the classification of highways according to traffic and providing a measure of highway cost. The true basis of highway cost is the cost-per-ton basis, only to be determined by a survey.

It further helps in planning a highway program and making a budget for it, in organization of a personnel, in solving problems of legislation and finance, and in coordinating highway transportation with rail and water transportation. After the main survey is finished the collection of data can continue with a skeleton organization, as is being done in Ohio.

Mr. Schlesinger's talk was followed by an exhibition of lantern slides illustrating some of the points brought out in his talk.

Field Testing Concrete

H. F. Clemmer, Solvay Sales Corporation, former engineer of tests of the Illinois state highway department, spoke of the importance of field tests in judging concrete pavements, with particular reference to the knowledge of aggregates which may be derived from such tests. Also such field tests are checks on specifications and on the materials specified.

One interesting conclusion Mr. Clemmer gave was that the soft limestone of the Middle West gave concrete considerably stronger in cross-bending than hard stone. Such cross-bending strength is more important than compressive strength, as was illustrated in the famous Bates road tests in Illinois.

A practical use of field tests of concrete in tension is to determine how soon a newly constructed pavement may be safely opened to traffic. A study of pavement failures from cores taken from the pavements showed that a lack of cement was the commonest cause of such failures. The most careful selection and inspection of materials does not provide against factors in construction which have a greater influence on the final construction than the nature of the materials themselves.

Vibrations from Blasting

A most interesting session was the thorough analysis of both the legal and the engineering phases of quarry blasting vibrations. As readers of Rock Products already know the General Crushed Stone Co. has made a most exhaustive study and investigation of this subject in connection with alleged damages to buildings in the neighborhood of its Winchester, Mass., quarry.

Harold Williams, Jr,, an attorney of Boston, Mass., handled the legal phases of the problem. He said that most of the court records of such cases involved direct damage such as throwing stone, air concussion, etc. There was, when this case came up, little or nothing of record on damage by earth vibrations. This present problem of alleged damage by earth vibrations, or shocks, is the outgrowth of present quarrying methods in which well drills and infrequent heavy shots play important parts. The effects of earth vibration are widespread; the results are indirect; there are various causes of such vibrations other than blasting such as heavy machinery in motion, rapidly moving trains, motor trucks, etc. The law covering vibrations and damage from them is different from the law of damages by blasting direct.

Negligence the Big Factor

Mr. Williams said ordinarily a quarry operator cannot be held liable for damage by blasting, except when caused by negligence. Of course, there may be instances where it is negligence to do any shooting at all in the presence of buildings and structures, or in using too large shots. Absence of negligence is the basis of defense in most cases.

Another possible phase of liability is that an owner may be liable for use of his land in creating a nuisance. Quarry blasting by well drilling lacks the legal definition of a nuisance because it is not a continuous operation.

Where licenses and permits are required to do blasting failure to obtain such license or permit is *prima facie* evidence of negligence. On the other hand where licenses have been granted by proper authorities, the courts have commonly held there can be no negligence.

Different Methods of Attack

In the General Crushed Stone Co. case, the quarry operator, Mr. Williams said, has successfully met all forms of attack against its blasting operations. He then sketched the history of the operation since it was taken over by the company some years ago. There was a general feeling in the neighborhood that the blasting was causing damage to nearby dwellings; the previous operator had paid some money for alleged damages. The General Crushed Stone Co., however, started a thorough investigation to find out whether or not the blasting actually was doing any damage. The investigators were amazed to find that the vibrations were so infinitesimally small that they could be determined only with difficulty by sensitive instruments.

This investigation was well under way when the company was confronted with its first suit, which was referred to a master for trial. The actual proceedings occupied about 75 days, and the case was continued over several years. The first difficulty met with in defending the suit was the evidence of alleged "eye-witnesses" of damage claimed to be done. Such testimony is very hard to combat, because the witnsesses are often sincere in their belief that the vibration or shock from blasting is severe, because the human body is very sensitive to vibrations of that kind.

There was no accurate measure of the intensity of such vibrations to furnish scientific proof that the alleged damage could not have been caused by the blasting. Quantative studies of vibrations with attention to their effects on building material had never been made. Consequently data on these studies made and assembled for this case gave the defendant quarry company an advantage over the plaintiff, who knew practically nothing about the subject.

A portable seismograph, or vibration re-

cording apparatus, was first used to study the intensity or strength of the vibrations and later steel pins from 4 in. to 15 in. long, ¼-in. in diameter. The pins are placed upright on a smooth and level surface and the amount of vibration necessary to overturn them can be calculated, and checked from the seismographic observations. The pins and their use proved of greater value in court than more complicated devices because their application could be readily explained.

In this case the master was taken to the quarry and thoroughly educated in the entire process, the drilling of the holes, loading, firing the shots, use of the seismograph and how the intensity of the vibrations was computed. This case dragged on until the building involved was sold and the plaintiff lost interest; and the case died a natural death.

The next attack on the quarry operation was an attempt to have the Woburn city council rescind its permit to the company for the storage of explosives. There was a public hearing at which the company was defended along the general lines already described; also that it was a local public service and a contributor to the city's welfare and prosperity. The complainants did not succeed in winning a majority vote of the council.

Jury Trial Case

The most recent attack was the trial of two suits for damages, and these cases were tried before a jury. There was a crowd of others waiting to file suits should these be successful, so the trial was a very important one to all concerned.

Besides the line of defense already described there is another point very important in such cases, and this is that cracks in plaster and stucco walls and ceilings are very common, and are readily explained by structural experts by faulty construction, and the natural shrinkage of the timber used in most houses. Consequently a careful examination should always be made of such buildings by experts to see if the alleged damage from blasting is of this character.

The plaintiff, Mr. Williams said, seldom claims that he actually saw the crack open, but that the cracks appeared sometime after the blasting and that he infers the blasting caused them. Experts can readily show that such cracks could not have been caused by blasting, but are caused by foundation settlement; expansion, contraction and shrinkage of lumber, etc. This case resulted in two clean verdicts for the defendant.

Points for Other Quarry Operators

Mr. Williams said sooner or later most every quarry operation would meet with similar difficulty, and he suggested the following ways of preparing for such a contingency: (1) Be sure to have all the necessary licenses and permits; (2) Keep a careful, accurate, and if possible diagrammatic record of each blast, including besides time, place, etc., the location of the holes, spacing of holes, powder charges, amount of rock brought down, etc.; (3) Remember that the problem is largely a psychological one, that people believe what they say about the severity of the vibrations, that the mob psychology of the neighborhood is also very important, that friendly neighbors are more to be desired than hostile ones; that the best way to avoid hostility is to take your neighbors into your confidence and show them what you are doing and how; (4) Be prepared for hostility by getting seismograph records, or pin records, of every blast, in or near the houses of neighbors who may make trouble; there is no reason why everyone should not take this precaution; (5) If satisfied your operation is legal and you are not doing damage to your neighbors' property, don't weaken and voluntarily pay damages; go ahead and put trust in the justice of the courts.

Scientific Study of Quarry Blasting Vibrations

Prof. Edward H. Rockwell, dean of the college of engineering, Rutgers University, New Brunswick, N. J., read a paper of great value to all quarry operators who may be faced with similar law-suits to those described above. He is the expert employed by the General Crushed Stone Co. to determine the actual amount of vibration from its blasting operations. As this paper will be published in a subsequent issue we will not attempt here to more than touch the high points.

Prof. Rockwell said that modern methods of deep-hole well drilling and shooting had made air vibration, or concussion, a negligible factor as a cause for possible damage. Earth shock or vibration, however, can be distinguished for several thousand feet. It is of the same general character as an earthquake shock or vibration, but of very much less intensity, or strength.

By means of a portable seismograph a comprehensive study was made of all the characteristics of these vibrations, including the frequency of the vibration, its acceleration, velocity, its amplitude (length of movement), force, or possible destructive effect. Prof. Rockwell did much original research to develop these data and apply them so that their effects on ordinary buildings and building materials might be determined with accuracy.

Briefly, he found that the average dwelling house or building had a factor of safety of 50 to 60, and in some instances 100 as regards the stresses created by the vibrations from these quarry blasts. In other words the average building construction is from 50 to 100 times stronger than any that would be destroyed by such vibrations as occur in quarry blasting.

Vibrations from heavy machinery have been found to be 6 to 30 times greater than the blast vibrations in these cases, and a severe earthquake is about 400 times greater. Moreover, such vibrations always produce a very distinctive type of cracking, readily explained and recognized.

Examination of such buildings by engineering methods show that shrinkage, expansion and contraction of the timber frame do account for the cracks in walls and ceilings. In one particular case investigated the movement of a center plastered partition from this cause was 100 times as great as was possible from blasting vibrations. Similarly, cracks in exterior stucco are almost invariably explained by expansion and contraction, or foundation settlement.

In modern blasting operations there are two general problems involved: (1) the problem of quarry blasting control to within limits that insure vibrations of too little intensity to cause damage; (2) the problem of the structural engineer to determine what the stresses, or capacity to do damage, of the blasting vibrations actually are.

Operating Men's Luncheon

A special luncheon was held for operating men, superintendents and manufacturers of machinery on Tuesday noon to discuss problems peculiar to operation. Naturally the discussion ranged over a wide field as the subject is so broad. Perhaps as interesting a topic as any that was discussed was recent developments in safety work. The question of the advisability of requiring men to take a physical examination before employment began provoked a great deal of talk. It seems that such a course is being forced on some operators by the compensation laws of certain states, these laws being so drawn that the company employing is responsible for accident or illness of the employe, even though it might be shown that the cause of such accident or illness came from his condition before his employment began.

The effect of safety work and education on the cost of compensation insurance was discussed, one firm claiming that it had effected a 10% reduction in rates by such work, while others said that it had effected no reduction but they intended to keep on with it just the same.

Among the interesting things brought out were that cement quarries had a lower accident rate than crushed stone quarries and this was ascribed to the longer time that safety work had been carried on in these quarries.

Causes of fire and fire drills were talked over. One speaker said that in his case the fire drill did not work out as expected when a fire came.

An attempt to debate the relative merits of gas-electric and straight gas shovels did not bring out much, as apparently none of those present had prepared for such a discussion.

It was suggested that for next year's meeting questionnaires be sent out to find what topics would especially interest superintendents and operating men so that a program could be prepared and speakers appointed to discuss these topics.

Business Session

THE principal business transactions of the convention were, the adoption of a schedule of dues, not obligatory, but as a guide to members in selecting the number of memberships they should take to adequately support the association; the changing of the constitution to provide for this; the changing of the constitution to provide for two new regional vice-presidents; the adoption of a resolution commenorating the lives, enthusiasm and work and deploring the loss of two past-presidents, who died during the year—F. W. Schmidt and John J. Sloan.

The schedule by which producers are asked to be guided begins with an annual production of 50,000 tons a year and annual dues of $50, and proceeds by increments of 50,000 tons and $50 a year dues to 500,000 tons a year, with dues of $500 a year. With a production of from 500,000 tons to 750,000 tons, $750; 750,000 tons to 1,000,000 tons, $1000, etc. For over 1,500,000 tons, the suggested dues are $1500.

It is intended to keep the same system of voluntary dues in the form of $25 a year membership but to ask members to be guided by the "above schedule and their consciences." The dues may be paid annually or semi-annually in advance.

The Southern and Northern divisions of the association were divided into two parts each, and two new regional vice-presidents were elected.

Officers Elected

The officers of the ensuing year elected at the Detroit convention are:

President, Otho M. Graves, vice-president and general manager, General Crushed Stone Co., Easton, Penn; regional vice-presidents: Canada, C. M. Doolittle, president, Canada Crushed Stone Corp., Ltd., Hamilton, Ont.; Eastern, Mortimer Wandell, president, New York Trap Rock Corp., New York City; Central, G. J. Whelan, president, Kelley Island Lime and Transport Co., Cleveland, Ohio; Southern, T. I. Weston, Weston and Brooker, Columbia, S. C.; Southwestern, W. F. Wise, president, Texas Trap Rock Co., San Antonio, Texas; Northern, W. R. Sanborn, vice-president, Lehigh Stone Co., Kankakee, Ill.; Western, A. R. Wilson, president, Granite Rock Co., Watsonville, Calif.

Directors were elected as follows: H. E. Bair, Ohio; W. M. Andrews, Ohio; F. W. Schmidt, New Jersey; C. D. Brewer, Minnesota; A. S. Lane, Massachusetts; F. T. Gucker, Pennsylvania; J. W. Stulle, Virginia; W. L. Sporborg, New York; A. L. Worthen, Connecticut; W. W. Boxley, Virginia; Allen Patterson, Ohio; L. R. Cartwright, Indiana; O. P. Chamberlain, Illinois; Harry Landa, Texas; J. C. King, Ohio; Thos. McCroskey, Tennessee; F. C. Murphy, Illinois; Stuyvesant Peabody, Illinois; James Savage, New York; J. F. Schroeder, Iowa; R. B. Tyler, Kentucky; Russell Rarey, Ohio; F. C. McKee, Pennsylvania; A. P. Rodes, Tennessee; Newton R. McDowell, Missouri. Representing the Manufacturers' Division: Arthur F. King, S. R. Russell and N. S. Greensfelder. In addition to these all the past-presidents, A. J. Blair, Wisconsin; John Rice, Pennsylvania; E. J. Krause, Illinois, and the regional vice-presidents are also members of the board.

The board re-elected James Savage treasurer; A. T. Goldbeck, director of the Bureau of Engineering, and J. R. Boyd, secretary.

The Banquet

THE annual banquet of the National Crushed Stone Association is always a pleasant occasion and this year it was unusually good.

Howard E. Bair, general manager of the France Stone Co., was toastmaster. Before he took charge of the program President Graves paid a feeling tribute to the two ex-presidents of the association who had died during the year, F. W. Schmidt and John Sloan, and asked all present to rise and stand in silence for a moment in reverent remembrance.

A. J. Brosseau, president of the Mack Truck Co., was unable to be present on account of severe illness and his place was taken by Charles M. Upham, who as director of the American Road Builders Association, director of the highway research board of the National Research Council, and the other important positions of the sort he holds, is perhaps the best known of American highway engineers. He spoke on "Personality of Highway Safety" and his talk was intended to show that engineering could not possibly remove all the causes of accidents; the personality of the driver offers a factor the engineer cannot overcome. He was impressed by the curious psychological phenomenon of a courteous gentleman being changed to an obstinate mule the moment he gets behind a steering wheel, as often happens. Mr. Upham related his own experience in an accident that confined him to the hospital and said he was glad to have been the patient in the hospital rather than the driver whose recklessness caused the accident, and who escaped unhurt.

Mr. Upham highly praised the taxicab companies who are carrying on safety campaigns. He wanted every driver to feel the same sort of responsibility that the locomotive engineer feels when he takes his train out on the road.

Frank Sheets, chief highway engineer of the Illinois division of highways, took for his "text" Luke 3:5, "Every valley shall be filled; every mountain and hill shall be brought low, the rough places shall be smoothed and the crooked shall be made straight." His talk was on roads as an embodiment of unselfish thought, and he showed how the unselfish thought had spread from the township to the county and from the county to the state and finally it was spreading to the nation.

Mr. Sheets used other biblical quotations than his text and the speaker who followed him, Dr. E. J. Cattell, of Philadelphia, had some highly original scripture to offer by way of contrast. His talk had its serious moments, however, and in one of them he illustrated how as statistician of Philadelphia he had been able to show how the receipts from taxation might be increased by the building of highways that gave access to unoccupied land. It was on account of this showing that the highways were built and the returns were as predicted.

J. Walter Dohany, general attorney of the Michigan Central railroad, closed the evening with an appropriate address.

Manufacturers' Division Meeting

THE annual business meeting of the Manufacturers' Division was held Thursday afternoon, January 20, Chairman M. B. Garber presiding. The minutes of the last meeting held in New York City on October 15, 1926, were read and approved. The report of the nominating committee was then read and the nominations for the new chairman, vice-chairmen and members of the board of directors were accepted by a unanimous vote of the meeting. The list of the new officers is given below.

The retiring chairman then turned the gavel over to the new chairman, Arthur F. King. Appreciation of the good work done by Mr. Garber was expressed by a rising vote. The only new business transacted was the passing of a motion for the chairman to appoint at an early date a committee to have charge of the program for next year's joint meeting of operating men, superintendents and manufacturers.

All of the manufacturers exhibiting agreed that this year's exposition was the best that had ever been held from their point of view.

New Officers of Manufacturers' Division

Arthur F. King, chairman, Marion Steam Shovel Co., Marion, Ohio.

J. R. Boyd, secretary, 651 Earle Bldg., Washington, D. C.

Gordon Buchanan, vice-chairmen, C. G. Buchanan Co., New York City.

R. Grub, Canadian Explosives, Ltd., Montreal, Quebec.

E. G. Lewis, Bucyrus Co., Milwaukee, Wis.

H. M. Davison, The Hayward Co., New York City.

C. B. Andrews, Taylor-Wharton Iron and Steel Co., High Bridge, N. J.

L. W. Shugg, General Electric Co., Schenectady, N. Y.

Representing the Manufacturers' Division on the Board of Directors

Arthur F. King, Marion Steam Shovel Co., Marion, Ohio.

N. S. Greensfelder, Hercules Powder Co., Wilmington, Del.

S. R. Russell, E. I. du Pont de Nemours Co., Wilmington, Del.

Board of Directors—Manufacturers' Division

In addition to the chairman and vice-chairman the following were chosen as directors:

Geo. G. Armstrong, Armstrong Mfg. Co., Waterloo, Iowa.

W. E. Farrell, Easton Car and Construction Co., Easton, Penn.

M. B. Garber, Sanderson-Cyclone Drill Co., Orrville, Ohio.

R. W. Gillespie, Jeffery Mfg. Co., Columbus, Ohio.

Fred A. Gill, Gill Rock Drill Co., Lebanon, Penn.

N. S. Greensfelder, Hercules Powder Co., Wilmington, Del.

E. W. Heath, Fate-Root-Heath Co., Plymouth, Ohio.

John M. Johnson, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Thomas MacLachlan, Vulcan Iron Works, Wilkes-Barre, Penn.

Wm. H. Norrington, Robins Conveying Belt Co., New York City.

J. Reynard, Loomis Machine Co., Tiffin, Ohio.

S. R. Russell, E. I. du Pont de Nemours Co., Wilmington, Del.

B. G. Shotton, Hendrick Mfg. Co., Carbondale, Penn.

Exhibition of Machinery

PRACTICALLY all members of the Manufacturers' Division of the National Crushed Stone Association, exhibiting at the association's tenth annual convention, held in Detroit, at the Book-Cadillac hotel, expressed the opinion that the exhibition feature was more successful in every way than that of any convention previously held.

Fifty-three companies were represented with display booths, all of which were attractively decorated. Most of the exhibitors had some new product or new idea to present to the crushed stone producers and these seemed to be welcomely received. The exhibits in no way interfered with the meetings and served, instead, as a clearing-house for questions vital to many operating men. The exhibits were educational as well as interesting.

A list of exhibitors and a brief description of their booths follows:

Allis-Chalmers Mfg. Co., Milwaukee, Wis. This company exhibited a model of a gyratory crusher, driven by a roller-bearing motor through a Texrope drive.

Armstrong Mfg. Co., Waterloo, Iowa. Exhibited a model of an all-steel blast-hole drill, mounted on wheels. Also showed samples of drilling tools and other supplies.

R. H. Beaumont Co., Philadelphia, Pa. Exhibited a working model of a "LeClair" drag scraper operating in a miniature sand pit. Also, Simplex and Duplex bin gates.

Blaw-Knox Co., Pittsburgh, Penn. This company showed a working model of a clamshell bucket, operated through the use of a model hoist and derrick. Displayed literature describing complete line of Blaw-Knox equipment used in rock products industry.

Browning Crane Co., Cleveland, Ohio. Displayed bulletins describing complete line of cranes.

Bucyrus Co., South Milwaukee, Wis. One of the most interesting exhibits at the show. Bucyrus used two booths to show a miniature quarry, made to ¾-in. per foot scale throughout. The quarry represented one having a 40-ft. face, 175 ft. in length. In it were set up models of a 120-B 4-yd. full revolving quarry and mining shovel and a railroad-type shovel. Also models of two 30-yd. air-dumping Western cars. On top of the quarry face was mounted a statuette of a size 44-GT Loomis blast-hole drill. As a whole, an excellent exhibit.

Burrell Engineering and Construction Co., Chicago, Ill. Displayed electric-flasher views of crushed stone and cement plants designed and built by them. Also reprints of articles from ROCK PRODUCTS in which were described plants designed and built by them.

Cement Mill and Quarry, Chicago, Ill. Displayed copies of current issues.

Columbus McKinnon Chain Co., Columbus, Ohio. Exhibited a sample of "Hercules" solid-weld power shovel chain and displayed literature describing their complete line.

E. I. du Pont de Nemours Co., Wilmington, Del. Displayed all types of du Pont explosives used in rock products industry.

Easton Car and Construction Co., Easton, Penn. Exhibited an excellently constructed aluminum and bronze model of a heavy-duty quarry car. Also photos and booklets illustrating and describing all types of cars for the rock products industry.

Explosives Engineer, Wilmington, Del. Displayed four large panels of leaflets taken from the magazine, having to do with safety work and accident prevention .

Fate-Root-Heath Co., Plymouth, Ohio. The Plymouth people displayed several panels of photographs showing all sizes of gasoline locomotives in use in the rock products industry.

Flexible Steel Lacing Co., Chicago, Ill. These people exhibited a complete line of "Alligator" belt fasteners and "High Duty" fasteners (espepecially designed for conveyor belts); also samples of lamp guards.

General Electric Co., Schenectady, N. Y. Exhibited a huge flood-light, designed especially for quarry night work. Also displayed several airplane views of the different G-E plants, as well as moving pictures showing G-E equipped shovels in action.

Good Roads Mchy. Co., Kennett Square, Penn. Displayed catalogs and bulletins describing crushers and other machinery used in the crushed stone industry.

Grasselli Powder Co., Cleveland, Ohio. Exhibited samples of all kinds of explosives used in quarries.

Harnischfeger Sales Corp., Milwaukee, Wis. Displayed literature describing its complete line of shovels.

Hayward Co., New York, N. Y. An interesting exhibit showing a working model of a clamshell bucket operated through the use of a miniature hoist and derrick. Also bulletins describing their complete line of material handling equipment.

Hendrick Mfg. Co., Carbondale, Penn. Displayed samples of all kinds of perforated plates, screens, "Mitco" grating and elevator buckets.

Hercules Powder Co., Wilmington, Del. Displayed samples of all kinds of explosives used in the rock products industry. Hercules also had in its booth a moving picture machine showing blasts and other activities at a large crushed stone operation.

Heisler Locomotive Works, Erie, Penn. Exhibited a model, one-tenth size, of a 55-ton geared quarry locomotive, which illustrated clearly the principles of operation of this particular type of steam locomotive.

C. W. Hunt Co., West New Brighton, N. Y. The Hunt company exhibited a full size "Mitchell" electric vibrating screen.

Ingersoll-Rand Co., New York, N. Y. Exhibited Jackhamer drills, models DCR-23 and R-12. Also special catalogs for quarry operators.

Jeffrey Mfg. Co., Columbus, Ohio. Exhibited full size conveyor idlers, links, buckets and other parts. Also showed interior views of typical installations in crushed stone plants.

Keystone Lubricating Co., Philadelphia, Penn. Used two booths, attractively decorated, as a meeting and lounging place for friends.

Keystone Division, McGraw-Hill Pub. Co., New York, N. Y. Displayed copies of recent issue of Keystone metal-quarry catalog.

Koppel Industrial Car and Equipment Co., Koppel, Penn. Displayed photographs of cars, also booklets and general literature describing complete line of cars.

Loomis Machine Co., Tiffin, Ohio. Displayed a statuette of a size 4-GT blast-hole drill, rear end mounted on crawler-apron wheels.

Manganese Steel Forge Co., Philadelphia, Penn. Exhibited all sizes of "Rol-man" double lock mesh woven manganese steel screen. Also folders describing complete line.

Marion Steam Shovel Co., Marion, Ohio. Displayed six panels of 15 by 20-in. photographs showing Marions in use in quarries. Also moving pictures. As in past year, this well known company conducted an interesting guessing contest. The guess was, "Number of tons of rock per 10-hour day handled by Marion shovels during 1926 in the crushed stone industry." The winner of first prize in this contest was J. E. Brunner, superintendent of the Clay Center, Ohio, plant of the Kelley Island Lime and Transport Co.

Midwest Locomotive Works, Cincinnati, Ohio. Displayed panels of photographs of all sizes and models of gasoline locomotives from 3½ to 25 tons, also bulletins.

National Crushed Stone Association, Washington, D. C. Displayed a large map of the United States showing federal-aid highways. This proved of great interest to many producers. Also displayed were charts itemizing what the association can do for stone producers and some statistics on highway construction.

National Safety Council, Chicago, Ill. Displayed several placards and panels featuring accident-prevention work.

Ohio Crushed Stone Association, Columbus, Ohio. Displayed copies of current issues of "Better Highways."

Osgood Co., Marion, Ohio. Displayed several panels of photos showing shovels at work in quarries. Also several different booklets and bulletins covering their entire line of shovels.

Pit and Quarry, Chicago, Ill. Displayed copies of current issues.

Robins Conveying Belt Co., New York, N. Y. Exhibited a full size "Vibrex" screen and 3- and 4-pulley conveyor idlers. Also photographs of plants in which Robins equipment is installed.

Rock Products, Chicago, Ill. Displayed copies of current issues, including the ANNUAL REVIEW AND DIRECTORY NUMBER (December 25, 1926, issue).

Sanderson-Cyclone Drill Co., Orrville, Ohio. Exhibited a working model of a No. 14 standard non-traction electric blast-hole drill. Also photos of machines in use in quarries.

Smith Engineering Works, Milwaukee, Wis. Exhibited a working model of a crushed stone plant, complete with primary (gyratory) crusher, conveyor, secondary breaker, bucket elevator, screens and bins. A truly interesting exhibit.

Symons Bros. Co., Chicago, Ill. Displayed photographs of disc and cone crushers. Also catalogs.

Taylor-Wharton Iron and Steel Co., High Bridge, N. J. Samples of manganese and orbit steel pins, links and repair parts for shovels, crushers and other stone plant equipment.

Thew Shovel Co., Lorain, Ohio. Displayed a large panel of photographs showing Thew shovels at all kinds of work. Also many pieces of literature.

Traylor Engineering and Mfg. Co., Allentown, Penn. Complete array of booklets describing entire line of machinery for crushed stone plants.

Traylor Vibrator Co., Denver, Colo. Exhibited "The Screen Supreme"—a new type of vibrating screen introduced for the first time to the stone industry. Also an automatic laboratory test screen.

Troco Lubricating Co., Philadelphia, Penn. Exhibited model of gyratory crusher lubricated with Troco liquid crusher grease.

W. S. Tyler Co., Cleveland, Ohio. Exhibited one-half size model of a 3-ft. "Hum-mer" screen, complete set of testing sieves, heavy duty V-32 vibrator of type 39 "Hum-mer" screen. Also samples of woven wire cloth.

U. S. Bureau of Mines, Washington, D. C. Exhibited a Baloptician machine showing first-aid views. Also complete array of protective and first-aid equipment and a model of a mine interior showing part of it dusted and part not dusted. This exhibit was perhaps one of the most educational ones at the show.

Vulcan Iron Works, Wilkes-Barre, Penn. Displayed an array of photographs of steam, gasoline, electric-trolley and electric-storage battery locomotives in use in rock products industry, in sizes from 4 to 40 tons (gasoline) and from 10 to 125 tons (steam).

Western Wheeled Scraper Co., Aurora, Ill. Displayed photos and bulletins illustrating and describing complete line of dump cars for crushed stone industry.

George D. Whitcomb Co., Rochelle, Ill. Displayed photos and bulletins illustrating and describing complete line of gasoline locomotives.

Williams Pat. Crushed and Pulv. Co., St. Louis, Mo. Exhibited an operating model of a "Mammoth" crusher and apron pan conveyor. Also photographs of actual installations of hammer crushers in typical crushed stone plants.

Convention Registration

With a registration of more than 500, the Tenth Annual Convention breaks all previous records. Following is the total registration:

Active Members

C. G. Adams, The France Stone Co., Bloomville, Ohio; W. J. Adams, Cushing Stone Co., Schenectady, N. Y.; R. H. Albright, Grove City Limestone Co., Grove City, Pa.; H. B. Allen, General Crushed Stone Co., Philadelphia, Pa.; Wm. H. Andrews, Lake Erie Limestone Co., Youngstown, Ohio; G. A. Austin, Piedmont Corp., Chestatee, Ga.; Arthur C. Avril, The France Stone Co., Toledo, Ohio.

B. R. Babcock, Callanan Road Imp. Co., So. Bethlehem, N. Y.; H. E. Bain, The France Stone Co., Toledo, Ohio; Geo. H. Balfe, Monon Crushed Stone Co., Monon, Ind.; M. M. Bamberger, Interstate Crushed Stone Co., Springfield, N. J.; M. M. Bales, Elmhurst Chicago Stone Co., Elmhurst, Ill.; P. F. Beam, C. C. Beam, Reesville, Ohio; C. C. Beam, C. C. Beam, Melvin, Ohio; A. G. Bennett, Hagersville Quarries, Hagersville, Ont.; A. L. Bengtson, A. P. O'Lachlin Co., LaGrange, Ill.; M. Z. Bentley, Carbon Limestone Co., Youngstown, Ohio; Otto Bierkamp, Quartzite Quarries, Inc., LaVerne, Minn.; G. G. Black, France Stone Co., Detroit, Mich.; Edwin T. Blake, Blake Bros. Co., San Francisco, Cal.; Roy L. Blake, Solvay Sales Corp., Detroit, Mich.; Albert D. Blakeslee, New Haven Trap Rock Co., New Haven, Conn.; Harold L. Blakeslee, Conn. Quarries Co., Inc., New Haven, Conn.; W. D. Bolin, The France Stone Co., Toledo, Ohio; L. C. Bonnell, F. T. Upton, Inc., Newark, N. J.; J. R. Boyd, Secy., N. C. S. A., Washington, D. C.; Harry H. Brandon, The Ohio Marble Co., Piqua, Ohio; J. E. Brennan, Kelley Island Lime & Trans. Co., Genoa, Ohio; Chas. D. Brewer, Duluth Crushed Stone Co., Duluth, Minn; Harold R. Brownson, Rowe Contracting Co., Malden, Mass.; Clarence L. Buchholtz, Genessee Stone Prod. Co., Batavia, N. Y.; W. J. Blackburn, Montreal Crushed Stone Co., Montreal, Que.

C. R. Callaghan, France Stone Co., Bellevue, Ohio; R. L. Callaghan, Supply Distributors Corp., Cleveland, Ohio; J. R. Callanan, Callanan Road Imp. Co., South Bethlehem, N. Y.; Keith M. Callanan, Callanan Road Imp. Co., Albany, N. Y.; A. B. Caldwell, Genessee Stone Prod. Corp., Batavia, N. Y.; R. S. Campbell, Holston Quarry Co., Knoxville, Tenn.; Walter A. Cary, John S. Lane & Son, Inc., Meriden, Conn.; L. R. Cartwright, Mid-West Crushed Stone Co., Indianapolis, Ind.; O. P. Chamberlain, Dolese & Shepard Co., Chicago, Ill.; Harvey N. Clark, Dolomite Products Co., Rochester, N. Y.; C. A. Cline, Canada Crushed Stone Corp., Hamilton, Ont.; Richard H. Cobb, Piedmont Corp., Atlanta, Ga.; John Collett, Mid-West Crushed Stone Co., Indianapolis, Ind.; Jas. P. Coyle, Consumer's Company, Chicago, Ill.; A. E. Crums, France Stone Co., Toledo, Ohio; J. C. Cushing, Cushing Stone Co., Inc., Schenectady, N. Y.; J. E. Cushing, Cushing Stone Co., Inc., Schenectady, N. Y.; Geo. Chyba, Amer. Crushed Rock Co., Delaware, Ohio; H. R. Cox, Amer. Crushed Rock Co., Delaware, Ohio.

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W. S. Nicol, Cross Engineering Co., Carbondale, Penn.; G. J. Nicholson, Manistique Lime & Stone Co., Manistique, Mich.; D. H. Norman, H. T. Routley, Toronto, Ont.

Mrs. F. C. Owens, Auburn, N. Y.

Mrs. F. R. Paterson, Natl. Lime & Stone Co., Findlay, Ohio; Geo. A. Parker, Chicago Pneumatic Tool Co., Detroit, Mich.; G. W. Patnoe, Engineer, Carey, Ohio; F. J. Pearson, Winnipeg Supply & Fuel Co., Stonewall, Man.; Joseph Perini, B. Perini & Sons, Framingham, Mass.; Fred L. Pettey, Chicago, Ill.; H. K. Porter, Hyatt Roller Bearing Co., Newark, N. J.

Walter Rea, Cleveland Rock Drill Co., New York City; Jos. R. Rearer, Ohio Hydrate & Supply Co., Woodville, Ohio; Mrs. Theresa Ripley, Buffalo Crushed Stone Co., Buffalo, N. Y.; Major T. M. Ripley, Buffalo, N. Y.; Dean E. H. Rockwell, Consulting Engineer, New Brunswick, N. J.

G. F. Schlesinger, Dir. Highways & Public Wks., Columbus, Ohio; Frank T. Sheets, Chief Highway Engineer, Springfield, Ill.; W. L. Shield, Peerless Explosives Co., Pittsburgh, Penn.; J. C. Showalter, Lancaster, Penn.; C. S. Simonsen, Peerless Explosives Co., Pittsburgh, Penn.; Mrs. V. I. Sloan, Chicago, Ill.; Wm. E. Stanley, Pearce, Greeley & Hanson, Chicago, Ill.; Mrs. Bert D. Strang, Ohio Crushed Stone Assn., Columbus, Ohio; Earl D. Stearns, Stearns Conveyor Co., Cleveland, Ohio.

Mrs. Nellie Tarbox, Tarbox-McCall Stone Co., Findlay, Ohio.

Chas. M. Upham, Engineer, Raleigh, N. C.

John N. Vander Vries, U. S. Chamber of Commerce, Chicago; Mrs. Carl Van Voorhis, Columbus, Ohio.

W. M. Weigel, Mo. Pac. R. R., St. Louis, Mo.; Hugo W. Weimer, Consulting Engineer, Milwaukee, Wis.; Harold Williams, Jr., 54 Devonshire St., Boston, Mass.; Riley Wilson, R. B. Tyler & Co., Washington, D. C.; Loyd Wilson, 854 Buhl Bldg., Detroit, Mich.; Fred Witmer, Ohio Hyd. & Sup. Co., Woodville, Ohio; Mrs. M. J. Woodhouse, Chicago, Ill.; Mrs. W. J. Woodhull, Chicago, Ill.; C. Lester Woolley, Rhode Island State Board of Public Roads, Providence, R. I.; A. W. Worthington, Pittsburgh Limestone Co., Pittsburgh, Penn.

Slate Association Convenes at New York

Sixth Annual Conference of the National Slate Association Greatest in History

THE sixth annual conference of the National Slate Association was opened on Tuesday morning, January 18, in the ball room of the Hotel Commodore in New York City by a short prayer from Mr. Jackson, who officiated in the absence of Chaplain Hamm. Following this the body, after a brief renewal of old friendships, settled down to business. The attention of all was centered on the annual report of the association activities which was given by N. M. Male, president. Summarized and in part Mr. Male said:

President Male Reviews Slate Industry in 1926

While it is true that our association during the past has had almost insurmountable obstructions in its path, we can, at this time, begin to realize the benefits derived from our mutual co-operation. These conditions and what success we have had I wish to credit to my loyal co-workers as well as to numerous members, both active and associate, who have always been ready to help the good cause.

While we as a nation have just closed two years of the nation's greatest prosperity, our industry has the problem of overproduction or under-consumption. The combination of these facts should cause worry over future prospects. To ignore the experience of the past is folly, to determine the future by past experience without recognizing the new factors in our economic life is more folly. Isn't it possible, when we are thinking of curtailment in the slate industry, some other industry managed by some genius is developing new products, many with much less merit, none with greater, which through a recognition of the new factors and requirements in business are developing and marketing substitutes which will far more than replace our curtailment?

Mr. Male then told of the struggle between competitive materials which at the particular time has great bearing on the slate industry and its future. The new competition, he said, could only be met by organization and co-operation between producers. He continued:

A trade association cannot run your plant, but it can stand for a better made article and for courteous, prompt and dependable service. It can teach better methods in the process of manufacture and in sales policies. It can encourage the elimination of waste. It has no police powers, but it can through a code of ethics advocate the things which are right and mutually beneficial that its members will at least hesitate to depart from in a contingency.

Let our competitors sell the idea of the requisites of an ideal material for a roof, a shower, a blackboard or a switchboard and let it be your industry's association task to sell the idea that slate is the material having the characteristics best adapted for the several purposes mentioned.

To further emphasize the need for an educational campaign he showed that the roofing slate field could be greatly expanded, for at the present time slate comprised only 0.8% of all the roofing sold. Although 1926 was a record building year, Mr. Male said, the slate industry did not get its proper share in the business. He then quoted the Bureau of Mines statistics for 1926 and continued:

> ***That a greater spirit of intelligent co-operation will prevail — and that by this co-operation—the entire slate industry will grow and prosper, these annual Slate Industry Conferences are held.***

Instead of gaining in 1926 our 15% over 1925 quota set at last year's conference, you will note we have LOST nearly 10% in roofing slate, 27% in blackboard slate slabs, 5% in school slates, 5% in value of other uses and 4% in total sales of slate. But in 1926, according to these estimates, we do show a gain of 7% in square feet of structural slate and 13% in electrical slate. Had our other markets shown similar increases, we would have easily achieved that task we set in 1922 of doubling our industry.

Strikes in 1924 and 1925 and the recovery period of early 1926 in the Vermont district have probably helped keep us from the goal. Once tell your customers you cannot supply them and they seek other materials and it takes some time to restore such markets.

In concluding, Mr. Male traced the growth of the association during 1926 and stressed the need of continuing this during 1927. For 1927, he said the industry would do well to consider the following in its schedule of activities:

1. Campaign to increase the use of slate.
2. Means to eliminate waste.
3. Installation of more modern equipment.
4. Protection against potential dangers.
5. Distribution of basic literature.
6. Relief from excessive taxes and freight rates.

Speakers from Allied Association

After the president's report the morning session was devoted to short addresses from representatives of allied associations. The first of these speakers was Col. D. H. Sawyer, secretary of the Associated General Contractors of America, and he outlined the points of common interest between the slate association and his own. The next speaker, J. C. Bebb of the Producers' Research Council of the A. I. A.—now known as the Producers' Council—outlined the origin and development of this council and touched upon the excellent work it is doing in the dissemination of technical data to architects.

Mr. Lundstrom of the General Electric Co. followed with a few words on the use of slate for panels and switchboards. He spoke for A. C. Streamer, chairman of the Panel and Switchboard Section of the National Electrical Manufacturers Association, and said the situation with regard to slate had improved considerably in the last couple of years.

Alfred E. Waller, managing director of National Electrical Manufacturers Association, then outlined their policy of co-operation through:

1. Creation of confidence and good fellowship between the members of Nema and the public.
2. Fact finding and the compiling of vital statistics.
3. The preparation and use of a manual on cost accounting.

The next speaker was Ira H. Woolson of the National Board of Fire Underwriters and after injecting a bit of humor into the meeting, he announced the very welcome news that the board of aldermen of New York City had just passed a bill prohibiting the further use of wooden shingles within the city limits and this bill is now awaiting the mayor's signature.

William Moore then spoke for the slate distributors, stating that it was the association's aim to promote harmony, co-operation and trade union, and with these the slate industry should take care of itself, fearing no other.

Contractors Group Reports

The setting contractors were represented by the president of the National Tile and Mantel Contractors Association, Clarence W. McCaulley, who made a very direct challenge to the association by stating that they were not merchandising their goods through the proper channels and said that the slate industry is building up a clientele that will wreck the business. He recommended that they get together and revise their methods of doing business and intimated that their present methods were antiquated and needed modernization.

This talk was followed by H. A. Daniel, chairman of the Slate Roofing Contractors' Group. He emphasized the great need for more co-operation between producers and consumers in doing away with the irresponsible or ignorant contractor. He blamed the failure of the slate industry to hold its own on those handling the slate between the time it is quarried and the time it is put on the roof. He urged

more teamwork between the different branches of the industry.

John F. Gowen of the Copper and Brass Research Association then gave an interesting outline of the work his association had accomplished in publicity and advertising and creating more confidence on the part of the public, and co-operating with other associations.

The session was then adjourned for a delicious buffet luncheon served in the adjoining tavern room and after everyone had satisfied his craving for food the session was resumed.

Mr. Briggs of the Ohio Valley Slate Co. entertained everyone with some live stories and this was followed by a splendid address by Dr. Robert W. McLaughlin of Worcester, Mass., on "The Danger of the Business Man Taking Himself Too Seriously." Dr. McLaughlin pointed out that almost everyone—at one time or another—takes himself too seriously, thinking that the center of the universe is on the end of his nose. He said that one is not humorous unless he can laugh at himself and illustrated how the strain of life can be relieved by being agreeable, and serviceable, but above all by having the quality of joy in your own inner life.

Slate Publicity and Sales

The last speaker of this session was W. A. Kitto, general manager of the Structural Slate Co., Pen Argyl, Penn., and he delivered a most instructive talk on "Proper Methods for Creating and Increasing Sales." He said the prime purpose of his organization was to create additional markets with the least expense, and although he laid no claim to having discovered the proper methods, it is evident that his methods were very effective, for their 1926 sales increased 20% over those of 1925. All money expended on sales promotion of any kind was charged to advertising and all methods of promotion were linked together. Last year they spent $50,000 on advertising and this was devoted to trade papers, trade directories, booklets, circular letters, exhibits and personal sales promotion work by special men assigned to that duty. Leads received through this publicity work were followed by their salesmen with the result that they increased their sales in some cities 100%.

Their real work of selling often started after slate had been written into the specifications, for then their competitors got busy and tried to substitute their own materials in place of slate. In order to overcome this kind of competition Mr. Kitto has picked out certain dealers in marble and tile in various cities and has co-operated with them so that they have often brought business in for slate instead of endeavoring to substitute other material.

Edwin W. Ely of the Division of Simplified Practice, U. S. Department of Commerce, was then called upon to make a few remarks regarding the three slate recommendations which the Slate Association sponsored in 1924, and which, after much study and many conferences, were finally put into service in 1925. Mr. Ely urged that a resurvey be made of the recommendations. Mr. Hays, association secretary, pointed out that simplified practice has been used to great advantage by many members of the association and then called for a motion that a resurvey of the situation be made. This motion was made and passed.

The session then broke up into four groups as follows:

1. Active Members and Contributing Members.
2. Slate Roofing Contractors' Group.
3. Slate Setting Contractors' Group.
4. Sales Agents and Slate Salesmen's Group.

In the first group meeting, the report of the U. S. Bureau of Mines statistics department on 1926 sales totals was distributed and a vote of thanks tendered this department for their splendid work in compiling these figures. Next year a still more comprehensive report is anticipated.

Technical Progress Reviewed

The first and only technical article of the convention was then read by Dr. Oliver Bowles, superintendent of the Non-Metallic Minerals Station of the Bureau of Mines. Dr. Bowles described the wire saw tests which they have been conducting and illustrated his talk with a number of stereopticon slides showing the various stages of the test. A brief description of the saw and the test made at the Colonial Slate Co.'s quarry near Pen Argyl, Penn., was given in Dr. Bowles' article on the work of his bureau in 1926 which appeared in the January 8 issue of Rock Products.

The test is still incomplete, having been temporarily discontinued on account of the severe winter weather encountered, but Mr. Bowles hopes to continue the test in the spring and if it proves as successful as his preliminary estimates indicate, he believes it would be well worth while running further tests in other quarries in different parts of the country so that data can be gathered on the efficiency of this saw when working under varying conditions.

Test Wire Saw at Pen Argyl

The present test at Pen Argyl was made possible by the contribution of five operators combined with the appropriation of $1500 to $1600 made by the Bureau of Mines. The saw, complete with the special wire rope, was imported from Belgium. It consists principally of two parts. First, the core drill, consisting of a vertical rotating drum 6 or 7 ft. long and 30 in. in dia. having special steel teeth on the bottom. It is driven by a 15-hp. electric motor mounted at the top and is fed sand and water. Second, is the wire saw itself, consisting of a 670-ft., three-strand ¼-in. steel cable mounted between two vertical steel angles 18 ft. long, one of which is stood in the 30-in. hole dug by the core drill and the other which is mounted over the end of the slate bench. The cable runs over 28-in. sheaves on these angles over a driving mechanism consisting of a 7½-hp. electric motor and a double belt speed reduction and over a cable tightening device having a load of 1000 lb. on it to keep the cable taut.

The cut made was 72 ft. long and sand and water were fed to the cut at two points —at the 30-in. core hole and also in the middle of the saw cut.

Preliminary Test Data

The following data have been compiled on this preliminary test:

The core drill, working 1 hr. 45 min. on slate rubbish, 1 hr. 2 min. without sand, and 10 hr. 25 min. on virgin slate or a total of 13 hr. 12 min. drilling, made a hole 6½ ft. deep. This is an average of 7.48 in. per hr. It drilled a maximum of 10 in. per hr. and cut out an average of 5.8 ft. per hr. Regular sea sand was used.

The wire cable was run at a speed of 14.3 ft. per sec., although the manufacturers advised 15 ft. per sec. In Europe they make cuts from 600 ft. to 800 ft. long. The cable, of course, must be endless, with a special splice — smooth — without any swelling, but the cost is less than 1c per foot for replacement. At the end of 8½ hr. cutting the wear on the cable was slight but noticeable and in the following estimates of cost it was estimated that a cable would only make one cut.

Figuring the cost of core drilling we have:

2 men 2 days @ $6/day to move and set up drill	$24.00
1 man drilling 3 days @ $6/days	18.00
Power	2.64
Interest on investment	.90
Repairs, sand, etc.	10.00
Total	$55.54

For the cost of a saw cut 72 ft. long, 7½ ft. deep and with an area of 540 sq. ft. requiring 54 hr. of cutting with a 7-hr. day requires 7 5/7 days. The cost is then:

2 men to set up saw, 2 days @ $6/day	$24.00
1 man cutting, 7 5/7 days @ $6/day	46.20
Cable (670 ft. @ .008c ft.)	5.36
Power	6.48
Interest on investment	.72
Repairs, sand, etc.	5.00
Total	$87.76

Summarizing these figures:

Cost of hole	$55.54
Cost of cut	87.76
Total	$143.30 or 27c per sq. ft.

A channeling machine would cut 50 sq. ft. per day, requiring 11 days at $20 per day (with two men) and would cost 40c per sq. ft.

Therefore the wire saw would seem to promise a reduction in cost of 33⅓%, not taking into account the elimination of stunning or shattering waste which accompanies the use of a channeling machine.

While this report is in no way final or conclusive, it created considerable interest and will be summarized in the next Slate Bulletin put out by the Slate Association.

Following this talk by Dr. Bowles, Hayden Owens reported very satisfactory results with a gang saw that he now has in operation in Vermont. It is mounted

on a stationary bed of concrete and works summer and winter, cutting 6 to 8 blocks per day at a saving in rock of 25%.

Election of Officers

The nominating committee then gave its report and the new officers for 1926 were duly proposed and elected, and after a short business session the meeting broke up. F. C. Sheldon was elected president for 1927.

Promptly at six o'clock all the members and their guests—many of them with their wives, assembled in the ballroom for the annual dinner and entertainment. Needless to say everyone enjoyed themselves immensely. The only serious talk of the dinner was given by Congressman Kent, who pointed out the need for active work by the association in Washington, where its voice should be heard regarding the various problems of the industry. Following the dinner, the party attended a theater party.

The following morning there was a continuation of the different group meetings after which came the annual Hosts' Club luncheon and entertainment given by the Associate Member Group—machinery and equipment manufacturers of the National Slate Association. After the luncheon and an address by the Rev. S. Steinmetz of Trenton, N. J., the convention was closed with a joint meeting of the slate roofing contractors and the United Roofing Contractors Association of America, President Moore of the latter association presiding.

The convention was run off in splendid style. The attendance was excellent, numbering about 125 members, associate members and guests. The general consensus of opinion was that this was the most interesting convention the association had ever had. All the topics discussed were timely and the speakers of a very high order. And a greater convention is planned for next year.

Large Stone and Lime Plant Merger in Carey, Ohio, District

ONE of the largest consolidations in the crushed stone and lime industries of Ohio was recently consummated with the formation of a new company to be known as the National Lime and Stone Co., with headquarters at Findlay, Ohio. The companies entering the merger were the National Lime and Stone Co., Carey, Ohio; the National Quarries Co., Carey, Ohio, and the Bluffton-Lewisburg Stone Co., Findlay, Ohio.

Nine plants are owned by the new company. Six of these belonged to the Bluffton-Lewisburg Stone Co. and are located as follows: One each at Findlay, Bluffton, Arlington and Rimer and two at Lewisburg. These are all crushing plants. The old National Lime and Stone Co. property at Carey, Ohio, consists of a crushing plant of about 600,000 tons per year capacity and a 14-kiln lime plant producing about 50,000 tons a year of finishing lime and hydrate. The company is at present rapidly completing a new battery of 12 kilns and a hydrating unit. (See Rock Products, December 26, 1926, issue.) The National Quarries Co.'s crushing plants are located at Carey and Bucyrus. Production from these two plants is about 700,000 tons per year of crushed limestone for ballast. The combined yearly production of all the plants is estimated to be about 2,500,000 tons of crushed stone and 100,000 tons of lime.

The terms under which the companies entered the merger have as yet not been made public. A letter issued by the new company states that the present executive and operating heads of all three companies will be retained and remain active in the new organization. Election of officers in the new company will take place within a short time, it is stated. Allen Patterson, president of the Bluffton-Lewisburg company, is reported to be slated for the presidency of the consolidated company.

Plan Conversion of Lehigh Plant at Mason City, Iowa

ACCORDING to a recent announcement in the Mason City (Iowa) *Globe,* the Lehigh Portland Cement Co. plant at that city will be converted to a modern wet-process mill within a short time. Plans have already been made, Oscar Davis, superintendent of the mill, stated, and work on the change will begin about February 1, 1927. No additional kilns will be installed, merely the necessary equipment to carry out the conversion. All the installation work will be in charge of F. L. Smidth & Co., New York.

Progress at New Houston Cement Mill

THE new $2,000,000 plant of the Trinity Portland Cement Co. now under construction in Houston, Texas, will be completed and ready for operation about August 15 or September 1, and at that time will probably have a capacity of 2500 to 3000 bbl. of cement per day, according to an announcement made by W. B. Stuegman, construction superintendent, recently.

Construction of the plant is going forward as rapidly as conditions permit and unless weather conditions delay the work the plant will be operating on schedule time. At the same time plans are being made for the enlargement of this plant, even before its completion. Permit was issued recently to the company for the construction of another building to the series already planned. This latter structure will cost approximately $337,500 and will be a one-story steel and concrete warehouse with "gunite" roofing. It will be 100x655 ft. and will be used for the storage of both raw and finished material.

The store stock room and the office building are now practically complete and work on the excavation for the eight finished cement storage silos was started recently. These will be 60 ft. in height and 40 ft. in dia. The docks and kilns are still to be erected, and it is estimated that 60,000 cu. yd. of earth will be moved in order to make way for these structures. O. V. Bartholomew is general superintendent over all the company's plants.

New Cement Mill Under Way Near Philadelphia

VALLEY FORGE CEMENT CO. has started construction work on a new wet process cement plant at West Conshohocken, Penn. Col. J. W. Fuller is heading the new organization. Further details concerning the new mill will be announced at a later date.

Leathem D. Smith Company Lands Large Stone and Sand Order

CONTRACTS for 1,200,000 tons of stone and sand, representing approximately $950,000, were closed at Detroit, Mich., recently by the Leathem D. Smith Stone Co., Sturgeon Bay, Wis., and the Smith-Truby Sand Co., which operates the steamer *Bay State.* The material is for lower lake ports and is to be delivered during the seasons 1927 and 1928.

The sand will be secured near Detroit and delivered by the *Bay State* equipped with the Smith unloading apparatus and sand settling boxes, while the stone will all be taken from the Leathem D. Smith Stone Co.'s quarry near the mouth of Sturgeon Bay, assuring the capacity operation of the quarry during the two coming seasons.

Besides this order the company has several other contracts for crushed stone to be filled during the coming season. The steamer *S. B. Way* is now being equipped with unloading apparatus at the Smith yard and will supplement the *Fontana and John McCartney Kennedy* for transporting crushed stone to Lake ports and Detroit.

Ross Island Gravel Deposit Not Taxed

SIR—Just a note to correct your short article with reference to Pacific coast states gravel plants on page 119 of the December 25, 1926, issue of Rock Products, which reads:

It was first claimed that this company would not have to pay the 10 cents per ton royalty paid by other producers taking gravel from the Willamette, but the latest report is that the Ross Island company will pay the same as the others.

We wish to correct this statement and advise you that the low water mark has been definitely established around our property and within these boundaries there will be no royalty charged by the state of Oregon against the Ross Island Sand and Gravel Co.

Ross Island Sand and Gravel Co.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning January 17:

CENTRAL FREIGHT ASSOCIATION DOCKET

14757. **Sand, lake, and gravel,** carloads, Lorain, O., via B. & O. R. R. Rates in cents per 2000 lb., except as noted.

To—	Prop.	Pres.
Geneva, O. (N. Y. C. delivery)	80	*14.5
Painesville, O. (N. Y. C. delivery)	80	*13.5
Mentor, O. (N. Y. C. delivery)	80	*13.5
Wickliffe, O. (N. Y. C. delivery)	70	*11.5
Willoughby, O. (N. Y. C. delivery)	70	*13.5
Lima, O. (B. & O. delivery)	110	120
Ottawa, O. (B. & O. delivery)	110	120

*Rates in cents per 100 lb.

14796. **Crushed stone,** carloads, Spore, O., to Ashley, Cardington, Delaware and Leonardsburg, O., following rates:

To—	Pres.	Prop.
Ashley, O.	90c	75c
Cardington, O.	90c	70c
Delaware, O.	100c	80c
Leonardsburg, O.	100c	80c

14797. **Gravel and sand,** except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica, carloads, Lake Ciecott, Ind., to Lima, O. Present rate, 6th class, 240c per net ton; proposed, 125c per net ton.

14812. **Crushed stone,** carloads. Rates per net ton as below:

From Greenfield, O., to N. & W. Ry. Representative Stations in Ohio.

To—	Pres.	Prop.	To—	Pres.	Prop.
Newtown	.....	130	Rarden	.....	90
Batavia	110	110	Otway	.....	90
Afton	.....	110	McDermott	.....	90
Williamsburg	110	110	Portsmouth	90	90
Mt. Oreb	.....	110	Taylorsville	.....	110
Sardinia	.....	110	East Danville	110	110
Macon	.....	105	Circleville	.....	90
Winchester	.....	105	Chillicothe	.....	80
Peebles	.....	95			

14828. **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing; loam, moulding or silica) and gravel, carloads, from Wolcottville, Ind. (Rates in cents per net ton.)

To—	Pres.	Prop.
Stevensville, Mich.	330	112
St. Joseph, Mich.	310	117
Benton Harbor, Mich.	310	117

14830. **Crushed stone,** carloads, Sandusky, Ohio, to Clarksfield, Ohio. Present rate, 80c per net ton; proposed, 70c per net ton.

WESTERN TRUNK LINE DOCKET

3089C. **Limestone,** ground, carloads, minimum weight marked capacity of car, but not less than 60,000 lb., from Centerville, Ia., to St. Louis, Mo. Present rate—Crushed stone, 13½c per 100 lb.; stone dust or ground stone, Class E or 16c.; proposed, $2 per net ton, description same as in connection with rate from Carthage, Mo., to St. Louis.

403G. **Lime,** carloads, between points in W.T.L. territory. Present, various rates; proposed, to be revised to the following bases: From points from which specific commodity rates on cement are published, to points to which such specific commodity rates apply, rates on lime, carloads, to be 1½c higher than cement rates, except that for distances of 100 miles and less, lime rates to be 2c higher than cement rates; from and to other points, rates on lime to be determined by the cement mileage scales rates prescribed by the Interstate Commerce Commission, plus 1½c, except that for distances of 100 miles and less, the arbitrary over cement rates shall be 2c.

Rates on lime, from shipping points in Missouri south of the boundary of W.T.L. territory, to destinations in W.T.L. territory to be determined by the cement mileage scales rates that are applicable from Ash Grove, Mo., applied to the actual distances from such origins, plus 1½c, except that for distances 100 miles and less the arbirtrary shall be 2c. Through rates from points east of the Illinois-Indiana state line to Wisconsin and Minnesota points to be not less than will result by constructing such rates on the same basis as recommended from Illinois origins to the same destinations. The minimum weight to be 40,000 lb. From and to points where such rates are desired, rates on lime, minimum weight 50,000 lb. or greater, to be published on the basis of 90% of the rates recommended above on lime, minimum weight 40,000 lb. From present and proposed rates covering typical movements, see statement below. Lime, carloads:

To St. Paul, Minn.

From—	Miles	Pres.	Prop.
Hannibal, Mo.	504.9	14	18½
Mincke, Mo.	594.9	17½	22½
Ste. Genevieve, Mo.	627.3	17½	27½
Ash Grove, Mo.	665.8	17½	28½
Pt. Byron, Ill.	330	14	17½
Cedarburg, Wis.	335.6	14	17½
Duluth, Minn.	151	9	13

To Omaha, Neb.

From—	Miles	Pres.	Prop.
Hannibal, Mo.	335	16	17½
Mincke, Mo.	436.4	16	20
Ste. Genevieve, Mo.	478.6	*21½	23½
Ash Grove, Mo.	377	16	21½
Pt. Byron, Ill.	360	16	17½
Cedarburg, Wis.	517.6	22½	21
Duluth, Minn.	497	22½	21

*St. Louis combination.

To Kansas City, Mo.

From—	Miles	Pres.	Prop.
Hannibal, Mo.	199	12½	15
Mincke, Mo.	271.1	12½	17
Ste. Genevieve, Mo.	341	19	20
Ash Grove, Mo.	183.3	12½	16½
Pt. Byron, Ill.	331	15½	17½
Cedarburg, Wis.	528.2	21	22
Duluth, Minn.	641	*29½	23½
Duluth, Minn.	641	†38½	.....

*St. Paul combination. †Class C.

Specific cement rates from Duluth and Hannibal. Mileage rates on other stations. W. T. L. Tariff No. 132D.

5203B. **Lime,** carloads, minimum weight 50,000 lb., from Chicago, Ill., to International Falls, Minn. Present—No through rate in effect, combination on Minnesota Transfer, 31½c, using Jones' Combination Tariff 228; proposed, 24½c per 100 lb.

3089C. **Limestone,** ground, carloads, minimum weight marked capacity of car, but not less than 60,000 lb., from Centerville, Iowa, to St. Louis, Mo. Present—Crushed stone, 13½c per 100 lb., stone dust or ground stone, Class E or 16c. Proposed—$1.85 per net ton, description same as in connection with rates from Carthage, Mo., to St. Louis. Not to be subject to Jones' Combination Tariff 228. (By shipper.)

SOUTHERN FREIGHT ASSOCIATION DOCKET

31232. **Stone, rubble,** crushed or broken, from Brownson, Ala., to Mobile, Ala., and Pensacola, Fla. In lieu of Class "A" rate of 41c per 100 lb., it is proposed to establish rate of 162c per net ton to Mobile, Ala., and 158c per net ton to Pensacola, Fla., on the above commodity, from Brownson, Ala., same as rate from Gantts Quarry, Ala. The proposed rates to apply on the following descriptions:

On interstate traffic—Stone, rubble, crushed or broken, carloads, minimum weight 90% of marked capacity of car.

On Alabama intrastate traffic—Stone, rubble, crushed or broken, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will govern.

31238. **Silica sand** from Ohio River crossings to Woodfin, N. C. Sixth class rate of 56½c per 100 lb. now applies. Proposed rates from Ohio River crossings to Woodfin, N. C.: On sand, silica not ground or pulverized, carloads, in packages or in bulk, minimum weight 40,000 lb., 473c per net ton, same as the current rates on molding sand from and to the same points; on sand, silica not ground or pulverized, carloads, in packages or in bulk, carloads, minimum weight 60,000 lb., from Ohio River crossings to Woodfin, N. C., 428c per net ton, same as the current rate on molding sand from Ohio River crossings to Hickory, N. C.

31245. **Sand and gravel** from Montgomery, Ala., to Nashville, Ga. Combination now applies. Proposed rate on sand and gravel, carloads, minimum weight 90% of marked capacity of car, except that when cars are loaded to their visible capacity actual weight will govern, from Montgomery, Ala., to Nashville, Ga., 176c per net ton, based on the proposed Alabama-Georgia Trunk Line scale.

31305. **Sand** from Coosada, Jackson's Lake and Prattville Junction, Ala., to Holt, Ala. It is proposed to cancel the $1.02 per net ton intrastate rate on sand, carloads, from and to points mentioned, published in L. & N. R. R. Tariff G. F. O. 3703, and thus permit the rate of 81c per ton of 2000 lb. published in L. & N. R. R., S. & N. A. Division Local Tariff No. 2, I. C. C. A14602, to apply.

SOUTHWESTERN FREIGHT BUREAU DOCKET

10790. **Lime,** from Ste. Genevieve, Mo., to points in Wisconsin. To establish the following rates in cents per 100 lb. on lime, carloads, minimum weight 30,000 lb., except as noted, from Ste. Genevieve, Mo., and other points shown in Group 3 of St. L.-S. F. Ry. Tariff 69K, to points in Wisconsin shown below on the M. St. P. & S. S. M. Ry.:

Milwaukee	*18½	Hewitt	23½
North Avenue	*18½	Marshfield	23½
North Milwaukee	*18½	Arpen	23½
Chestnut Street	*18½	Vesper	23½
Stowell	*18½	Wisconsin Rapids	23½
Bay View	*18½	Port Edwards	23½
Slinger	23	Nekoosa	23½
Allenton	23	Chippewa Falls	29
Theresa	23	Lake Hallie	29
Lomira	23	Eau Claire	29
Byron	23	Medina Jct.	23½
Hamilton	23	Dale	23½
Fond du Lac	23	Readfield	23½
N. Fond du Lac	23	Fremont	23½
Van Dyne	23	Weyauwega	23½
Oshkosh	23	Waupaca	23½
State Hospital	23	Sheridan	23½
Neenah	23	Amherst	23½
Appleton	23	Amherst Jct.	23½
Menasha	23	Custer	23½
High Cliff	23	Stockton	23½
Sherwood	23	Stevens Point	23½
St. Johns	23	McDill	23½
Hilbert Jct.	23	Plover	23½
Potter	23	Coddington	23½
Collins	23	Bancroft	23½
Quarry	23	Plainfield	23½
Valders	23	Hancock	23½
Madsen	23	Coloma	23½
Alverno	23	Liberty Bluff	23½
Manitowoc	23	Westfield	23½
Packwaukee	23½	Portage	23½
Monticello	23½	Rocky Run	23½
Endeavor	23½	Junction City	23½
Moundville	23½	Milladore	23½
Anacker	23½	Sherry	23½
Auburndale	23½		

*Minimum weight 60,000 lb.

It is proposed to establish the same rates to common points on the M. St. P. & S. S. M. Ry. as are applicable via other lines.

10791. **Lime,** from Springfield, Mo., to points in Oklahoma and Kansas. To establish a rate of 22½c per 100 lb. on lime, carloads, minimum weight 30,000 lb., from Springfield, Mo., to following Kansas and Oklahoma points: Carp, Midland Tower, Somers, Waco, Sumpter, Palestine, Cox, Paton, Adamville, Geuda Springs, Aumann, Orchard, Albright, Kan.; Hardy, Frankfort, Grainola, Foraker, Blackland, Pearsonia, Myers, Pawhuska, Nelagony, Tallant, Barnsdall, Giland, Nichols, Avant, Brad, Skiatook, Rotary, Sperry, Turley, Law, Tulsa, Edgar, Nirine, Streator, Perryman, Watkins, Glenpool, Bixby, Atlantic, Leonard, Kadashan, Stone Bluff, Cornell, McKay, Haskell, Yahola, Taft, Pecan, Muskogee, Shopton, Keefeton, Warner, Trojan, Perum, Briartown, Stigler, Kanima, Keota, Cartersville, Bokoske, Bedwell. The rate proposed, it is stated, is the same as in effect from Springfield, Mo., via the S. L.-S. F. Ry.

Correction

CALEB PAYNE, vice-president of the Gypsum Engineering and Manufacturing Co., Chicago, former connection with the U. S., Gypsum Co., Chicago, was as chief engineer of the fireproofing department and not chief engineer to the company as stated on p. 142, December 25 issue of ROCK PRODUCTS.

Sand-Lime Brick Production and Shipments in December

THE following data are compiled from reports received direct from 23 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting are two more than those furnishing statistics for the yearly estimate published in the December 25, 1926, issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having over two-thirds the production capacity in the United States and Canada.

Following the general decline in building activity during the winter months, production and shipments fell off, some plants not producing at all and others operating at lessened capacity. The prices received were slightly lower than the previous month. The following are average prices received in December:

	Plant Price	Delivered
Detroit, Mich.	$14.50	$17.50
Fullerton, Calif.	9.50	12.50
Sioux Falls, S. D.	13.00	.....
Lake Helen, Fla.	11.00	.....
Toronto, Ont.	13.10	15.60
Pengilly, Minn.	14.00	16.50
Woburn, Mass.	13.57	.....
Menominee, Mich.	11.00@12.00	14.50
Dayton, Ohio	12.50	.....
Hartford, Conn.	16.00	19.00
Washington, D. C.	13.50	16.00
Detroit, Mich.	.....	16.62
Atlantic City, N. J.	14.00	.....
Detroit, Mich.	14.00	16.50
Minneapolis, Minn.	10.00	12.75@16.50†
Michigan City, Ind.	11.00	.....
Lakeland, Fla.	10.50	14.50
Detroit, Mich.	12.50	15.10
Pontiac, Mich.	12.50	16.00
Rochester, N. Y.	.....	19.75
San Antonio, Texas	12.50	14.00
Syracuse, N. Y.	16.00	20.00
Grand Rapids, Mich.	12.00	.....

†L.C.L.

The following statistics are compiled from data supplied from 23 plants reporting 1926 totals and from 23 plants furnishing the regular figures for the month of December.

Statistics for 1926 and December, 1926

	1926*	December
Production	247,513,000	12,049,000
Shipments (rail)	101,475,000	3,825,000
Shipments (truck)	147,826,000	7,401,000
Stocks	.....	11,583,000†
Unfilled orders	.....	7,701,000‡

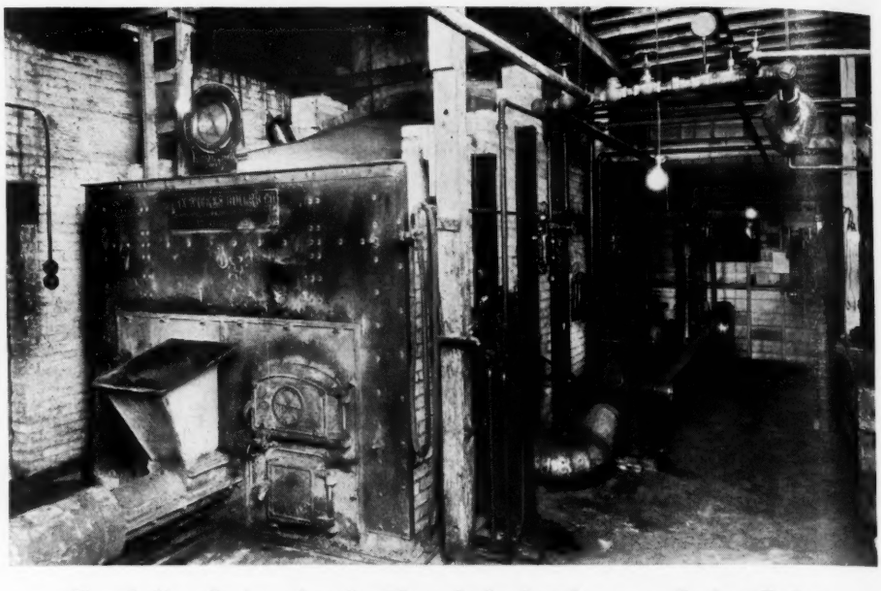
*Revised to include data from 6 plants not shown in the previous statistics published December 25, 1926.

†Incomplete, one plant not giving data on stocks at end of December.

‡Incomplete, two plants not giving data on unfilled orders.

Plants Make Improvements

As already noted in a previous issue, the Winchester Brick Co. has added many improvements to their rebuilt Woburn, Mass., plant. All the machinery has been electrified and a new rod mill and complete volumeter installed. The Sand Lime Products Co., Detroit, Mich., has put in a new boiler plant, including a Jones underfeed stoker made by the Sanford-Riley Stoker Co., and a Hoppes feed water heater furnished by the Coon-De Visser Co., Detroit. A great savings in fuel is expected to result from these new installations. The Albany Brick Co., Albany, Ga., has bought out the Silica Brick Co. at that place and is overhauling the entire plant. Production will begin early in February.



New boiler plant equipped with underfeed stoker recently installed at Sand Lime Products Co.

Eastern producers report several large orders recently contracted for; the Winchester Brick Co. furnishing the brick for the Motor Mart garage, said to be the world's largest garage, and the new Back Bay postoffice. Both of these buildings are under construction at Boston, Mass. The Atlas White Brick Co., Atlantic City, N. J., is filling brick orders for the Davis-Buick showroom at Philadelphia and several large garages and apartment houses in Atlantic City and Ocean City, N. J. At Fullerton, Calif., three large garages and one office building will use sand-lime brick supplied by the Orange County Brick and Tile Co.

Imports of German Brick Increased

It is evident from the above that the influence the small amounts of imported sand-lime brick have on the market along the eastern coast must be of little consequence. From January to October, 1926, German exports of sand-lime brick totaled about 359,000, of which about 345,000 were entered in the United States, chiefly at eastern coast cities. This is a tremendous increase as compared with exports in 1925 when only about 36,000 brick were exported, of which about one-half went to the United States. The peak months were June and August when about 135,000 and 92,000 brick, respectively, were shipped to this country. Just what the ultimate effects of increased importations of sand-lime brick will have on the industry in this country cannot as yet be predicted. It may be that the demand will create a market sufficient to absorb the imported and domestic product. As it stands now, the importations are just another example of the peculiar trend European export trade has taken—the offering of low-priced heavy commodities in markets hitherto thought of as entirely domestic.

Sand-Lime Brick in the Florida Hurricane

A REPORT of the Florida hurricane disaster with particular reference to a recent article by Maj. L. B. Lent, appearing in the November, 1926, issue of *Building Economy*, has been prepared by E. Roy Hall, vice-president and general manager of the De Soto City Brick Co., De Soto City, Fla. Some very interesting things developed in the course of Mr. Hall's survey of the damage caused by the storm in and about Miami. In general it is sufficient to say that Mr. Hall's findings do not coincide exactly with Maj. Lent's story; in fact, in many cases they appear to be widely different. The following brief excerpts from Mr. Hall's report are quite enlightening:

"On page eight of his (Maj. Lent's) article, there appear two pictures of the Meyer-Kiser bank and office building on N. E. First street, Miami, the walls of which Maj. Lent. asserts in the body of his narrative were 'of hollow units, faced with sand-lime brick at the front,' and which became, 'the sorry-looking mess seen in the illustration.' Under each of the illustrations on this page there appears the statement that 'curtain walls of hollow units and sand-lime brick' were stripped and torn out by the wind.

"Maj. Lent's reference to this building, I regard as the most serious mistake he made, for it will be hard for him to convince the public that, as the engineer for the Common

Brick Manufacturers' Association of America, he does not know the difference between a sand-lime brick and a clay face brick.

"The walls of the Meyer-Kiser building are built of hollow units—hollow *clay* tile—and common *clay* brick. The front of the building is faced with clay face brick, bought by the Donothan Building Co., 709 Huntington building, Miami, who erected the building. According to Mr. Bostwick of the Donothan Building Co., no sand-lime brick were used in the Meyer-Kiser building, either for walls or facing.

"I did find, however, other evidences of sand-lime brick construction which amply disprove the various statements in the *Building Economy* article, such as, 'Other synthetic materials, such as sand-lime brick were unable to withstand the destructive wind,' and again, 'sand-lime brick walls wholly inadequate.' Among these are the old ice plant of the Florida Power and Light Co., N. W. Sixth street and Miami avenue; a two-story store and apartment building on the corner of N. W. 10th street and Miami avenue; and a residence at 1329 Collins avenue, Miami Beach, besides several buildings at Fort Lauderdale, Dania and other points in the hurricane area.

"On my trip to this section in early October, I found two solid-looking business building at Fort Lauderdale, built of sand-lime brick which were undamaged, though wreckage of less substantial structures appeared on all sides; and at Dania, a bank building of sand-lime brick which suffered no damage to its walls. One of the buildings at Fort Lauderdale was faced on two sides with clay face brick, as was the bank building at Dania. The other Fort Lauderdale building was faced with clay brick on one side only. The fact that clay brick were only used for facing in the walls fronting on streets, would indicate that their use was for ornamental purposes only."

Mr. Hall also mentions many other buildings of sand-lime brick which stood up well which Maj. Lent probably overlooked. He has taken an unbiased attitude and is prepared to submit proof to all of his statements, both by photographs and from the property owners themselves. He invites Maj. Lent's comments on his findings and hopes that by his report he has freed sand-lime brick from many of the unfair insinuations cast on its quality and fitness as a building material. The chief recommendation drawn from a study of the storm, Mr. Hall says is this:

"Whether we build of frame, or cement blocks or of tile, or of brick—and when I say 'brick,' I mean brick of any material—let us build substantially and well, slighting nothing, either in material or workmanship, in order that the creation of our brain and hand and wealth may stand through flood, fire, earthquake and hurricane as a monument to our integrity and honesty of purpose."

Empire State Sand and Gravel Association Holds Annual Meeting

THE Empire State Sand and Gravel Association is one of the fast growing and enterprising trade organizations of the country. It was started less than two years ago by representatives of a few companies and its growth was shown at the annual meeting held in Buffalo, January 6, by the fact that 28 persons, representing 20 companies, attended. The choice of Buffalo for the annual meeting was a good one, as that city is in one of the largest sand and gravel producing areas of the state.

The meeting, in the Statler hotel, was called to order by J. E. Carroll of the J. E. Carroll Sand Co., president of the association, who reviewed the first year's work of the association and complimented the members on their loyalty and active interest.

John G. Carpenter of the Madison Sand and Gravel Corp., secretary-treasurer, presented his financial report, showing a balance on the right side of the ledger and suggested a plan of activities for the year 1927.

Resolutions were adopted expressing appreciation of the effective work of the outgoing officers, J. E. Carroll, president; G. K. Smith, vice-president, and John G. Carpenter, secretary-treasurer, and special mention was made of the fact that, while the association was scarcely a year old, it had accomplished many important things and had become a real force in the Empire State.

The constitution was amended to provide for the admission as associate members, firms selling sand and gravel equipment. An important feature of the meeting was a general discussion covering problems of sand and gravel production and methods of promoting the interests of the industry.

The following officers were elected for the ensuing year: G. K. Smith of the Albany Gravel Co., president; David Hyman, of the Buffalo Gravel Co., vice-president; John G. Carpenter, of the Madison Sand and Gravel Corp., secretary-treasurer. These officers and H. E. Moran of the Olean Sand and Gravel Corp. and John A. Taylor of the Valley Sand and Gravel Corp. constitute the executive committee.

The following producers were present:

J. E. Carroll, J. E. Carroll Sand Co., Buffalo, N. Y.
G. K. Smith, Albany Gravel Co., Albany, N. Y.
John G. Carpenter and C. A. Adams, Madison Sand and Gravel Corp., Hamilton, N. Y.
Henry F. Marsh, Consolidated Materials Corp., Buffalo, N. Y.
E. D. Foote, Consolidated Materials Co., Rochester, N. Y.
John A. Taylor, Valley Sand and Gravel Co., Rochester, N. Y.
Nathan Oaks and Carlton Oaks, Nathan Oaks and Sons, Oaks Corner, N. Y.
W. J. Gilmore, Valley Sand and Gravel Co., Rochester, N. Y.
Frank A. Eldridge and J. W. Robinson, Eldridge and Robinson, Auburn, N. Y.
L. H. Kessler, Springville Sand and Gravel Co., Springville, N. Y.
H. A. Stelley, Buffalo Gravel Co., Avon, N. Y.
W. F. Truby, Genesee Sand and Gravel Co., Buffalo, N. Y.
Willis M. Spaulding and D. E. Moore, Silver Spring Sand and Gravel Co., Silver Spring, N. Y.
Walter Sunderland, Sterrett Sand and Gravel Co., Springville, N. Y.
W. J. Winand, Jr., East Aurora Sand and Gravel Co., Buffalo, N. Y.
H. E. Moran, Olean Sand and Gravel Co., Olean, N. Y.
M. P. Ryley, Clarence Supply Co., Buffalo, N. Y.
R. W. Eberly, Buffalo Gravel Corp., Buffalo, N. Y.
W. G. Shoemaker, Daigler Sand and Gravel Corp., Williamsville, N. Y.
B. M. Wilson and Jas. J. Pendergast, Genesee Washed Gravel Corp., Buffalo, N. Y.
M. B. Paxton and G. O. Spaulding, Silver Spring Sand and Gravel Co., Buffalo, N. Y.
David Hyman, Buffalo Gravel Corp., Buffalo, N. Y.

Merger of Four California Gravel Companies

CONSOLIDATION of four sand and gravel companies of Central California into one concern known as the Associated Gravel Co. became effective recently.

The new company merges all the properties and assets of the Niles Sand, Gravel and Rock Co., River Rock Gravel Co., Riverbank Sand Co., and the Coyote Gravel Co. The company will own and operate two modern sand and gravel plants at Niles, Alameda county, and Tracy, San Joaquin county, together with a modern sand plant at Riverbank, on the Stanislaus river. Plans are under way for the erection of an additional plant on the properties of the Coyote company, in the heart of the Santa Clara valley.

A subscription offering of $450,000 first mortgage (closed) 6½% sinking fund gold bonds of the consolidated company has been made by Hunter, Dulin & Co. and Schwabacher & Co., Oakland, Calif. Details of the offering are published in the financial pages of this issue.

The Niles Sand, Gravel and Rock Co. operates a plant at Niles, Calif. Estimated production from this plant is about 350,000 tons of washed and graded sand and gravel per year. The River Rock Gravel Co. produces about 300,000 tons of washed and graded sand and gravel from its operations at Tracy, Calif. The combined output of these companies and the other two companies entering the combination is about 1,100,000 tons per year. This will be increased after the new Santa Clara valley plant which is planned goes into production.

Current Abstracts of Foreign Literature

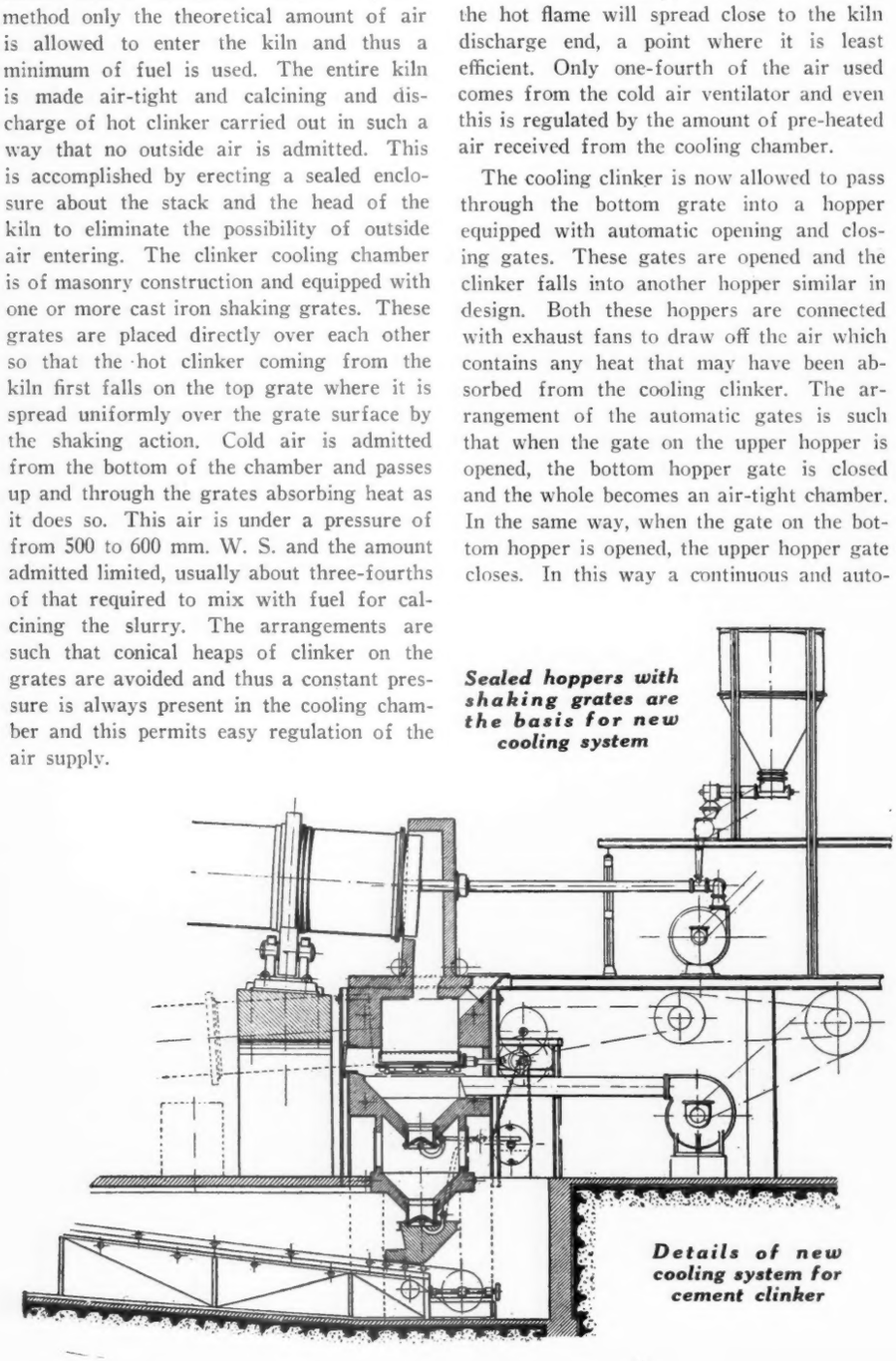
New System of Cooling Cement Clinker. The present-day operation of rotary cement kilns proceeds with a more or less excess of air. Little value is placed on making the intake end of the kiln air-tight and the discharge end serves merely as a place where the clinker is to be cooled. For this purpose, the hot clinker is allowed to drop into a separate rotary cooler where it is cooled and the hot air drawn off by air exhaust fan and passed back into the kiln or used for other purposes.

The new process for cooling cement clinker uses a "Stehmann" cooler. By this method only the theoretical amount of air is allowed to enter the kiln and thus a minimum of fuel is used. The entire kiln is made air-tight and calcining and discharge of hot clinker carried out in such a way that no outside air is admitted. This is accomplished by erecting a sealed enclosure about the stack and the head of the kiln to eliminate the possibility of outside air entering. The clinker cooling chamber is of masonry construction and equipped with one or more cast iron shaking grates. These grates are placed directly over each other so that the hot clinker coming from the kiln first falls on the top grate where it is spread uniformly over the grate surface by the shaking action. Cold air is admitted from the bottom of the chamber and passes up and through the grates absorbing heat as it does so. This air is under a pressure of from 500 to 600 mm. W. S. and the amount admitted limited, usually about three-fourths of that required to mix with fuel for calcining the slurry. The arrangements are such that conical heaps of clinker on the grates are avoided and thus a constant pressure is always present in the cooling chamber and this permits easy regulation of the air supply.

The heated air passes directly up and through the top grate and then passes through a right-angle-bend pipe to the fire box where it is mixed with the fuel. The right-angle turn the hot air makes is of particular importance for in this way the air gets a thorough washing and cleaning or separation from any clinker dust particles that might have been carried with it into the fire box. The strongly pre-heated air coming in contact with the fuel in the fire box accelerates combustion to such a great degree that unless the carrying air (cold air from the ventilator) has a great velocity, the hot flame will spread close to the kiln discharge end, a point where it is least efficient. Only one-fourth of the air used comes from the cold air ventilator and even this is regulated by the amount of pre-heated air received from the cooling chamber.

The cooling clinker is now allowed to pass through the bottom grate into a hopper equipped with automatic opening and closing gates. These gates are opened and the clinker falls into another hopper similar in design. Both these hoppers are connected with exhaust fans to draw off the air which contains any heat that may have been absorbed from the cooling clinker. The arrangement of the automatic gates is such that when the gate on the upper hopper is opened, the bottom hopper gate is closed and the whole becomes an air-tight chamber. In the same way, when the gate on the bottom hopper is opened, the upper hopper gate closes. In this way a continuous and automatic cooling process for the clinker has been developed wherein each hopper is a self-contained unit and air-tight. The completely cooled clinker now passes out of the bottom hopper onto a belt conveyor, or other type of conveyor and is carried to storage or the finish-grinding mills.

Sealed hoppers with shaking grates are the basis for new cooling system



Details of new cooling system for cement clinker

As stated before, the stack in this process serves merely to carry off the waste gases. Any tendency for air to be sucked into the kiln through the stack should be watched and there should always be maintained a slightly greater pressure at the kiln head than at the stack. For this purpose, a Venturi meter with a registering device is placed in the air line. Through this, it is possible to control and regulate conditions in the cooling chamber. The first application of this cooler system on a rotary cement kiln is said to have shown a savings of 20% in fuel and this is expected will be even greater when the principles are better developed. The illustrations shows this cooling system, developed by Fellner and Ziegler, Frankfort a Main, Germany, on an old rotary kiln.—*Zement*, **29**, 519-20.

Determination of Free Lime in Hydraulic Cement. "Wet" methods of determining the free lime in hydraulic cements are not in general so satisfactory as "dry" methods, which is due to the fact that further hydration proceeds during the determinations and produces more free lime. Extraction with a 25% sugar solution yields useful and valuable information for set cements, and is a rapid method for testing the cement where only small quantities of material are available. Passow's method (see *Zement*, 1923, volume 12, page 87), in which ammonium carbonate is heated with the cement and forms calcium carbonate with the free lime, is not very satisfactory owing to hydration effects.

The most satisfactory method for determining free lime is a thermal method in which the cement is heated at a temperature of 900 deg. C. for 10 minutes, converting the calcium hydroxide into calcium oxide, which is then determined by the rise in temperature produced when it is mixed with water. This gives reliable results for set and unset cements, and is particularly valuable in investigating the fire-resisting properties of cement or concrete.

Quick Setting Cementitious Compositions. Hydrated lime is mixed with about 4% of calcium aluminate and to this is added a small amount of aluminum sulfate (about 0.5%) 5% of magnesium carbonate and 0.3% sugar for retarding the set. The resulting cement has a quick initial set, high early and final strengths and good workability. *British Patent No.* 239,504.

Cement Products

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Ancient Art Reproduced in Cement

Concrete Forms Which Follow the Mayan and Aztec Civilizations of Old Mexico

By Matthew Paxton

ART treasures of ancient Mexico have been reproduced in cement with fine effect in the Atzec theater of San Antonio, Texas, which was completed recently.

The decorations of the theater have excited the admiration of all who have seen them. It took the combined efforts of archeologists, architects, Hannibal Pianta, an artist experienced in the use of plastic cement, and Henry Wedemeyer, a sculptor, to achieve this happy result.

The designs reproduced in the theater are due to the efforts of an extensive study covering a long period. Robert B. Kelley, the architect who conceived the idea, and R. O. Koenig, chief designer of the Kelwood Co., architects, devoted many months to the acquisition of examples of early Mexican art. Excellent specimens were found in the museums at Mexico City and Washington, D. C., and these served as models for the concrete reproductions.

Following the Spanish conquest of Mexico the temples of the Aztecs were destroyed. The Teocalli, principal temple of the Aztecs, was torn down and the sacrificial stone on which thousands of captives had been killed was buried. The Cathedral of Mexico City was built on the spot, and the sacrificial stone was dug up by workmen as the cathedral was being completed. They were about to cut it up for paving blocks when it was rescued by a priest and placed in the National Museum at Mexico City.

Urn suggested by Aztec art in the Aztec theater, San Antonio. The wall decorations are Mayan glyphs

In 1841, the explorer, Stevens, found under moss and vines in the jungle near the Temple of the Sun at Palenque a panel which has been duplicated in the Aztec theater at the landing of one stairway. The panel represents a human sacrifice to the god of the sun. An altar is supported by two crouching human figures. Two priests stand upon prostrate human forms. The original of this panel stood in the rear altar room of the Temple of the Sun.

The Panel of the Foliated Cross, which stood in the rear altar room of the Temple of the Cross at Palenque, has been copied for the landing of the stairway opposite the panel of the Temple of the Sun. It represents a priest in the act of sacrificing a human being, but in this case there is a cross, not unlike the Christian cross. An attempt has been made to explain its presence in a pagan land and among the stories told is one that St. Thomas visited Mexico in his wanderings and left behind him the symbol of Christianity.

In the walls of the promenade are three panels, the central panel containing an animal that resembles a tapir. The panels on either side are of priests.

Reproductions of Mayan art in the Aztec theater. Left—Jaguar head design common to ancient Mexican civilization. Right—One of the decorative lintels

Across the proscenium arch has been carved a likeness of the mythical plumed serpent. This was the symbol of Quetzelcoatl, god of the air. It was said that he appeared among the Toltecs in the guise of an old man with a white beard. At the

Chair suggested by Mayan art

time of Cortez' arrival it was thought that this god was about to return to the earth.

The head of the goddess of the water and the moon is reproduced in the heads which surmount the columns in the foyer of the theater. The columns are copies of those at Mitla. About the foyer are various symbols of Aztec and Mayan origin. The sun emblem is over the door which leads from the lobby to the foyer. Here and there are heads of the jaguar, which is seen so often in the carvings of the ancient races of Mexico. In the center of the foyer is an exact copy of the sacrificial stone which stood on the Teocalli.

The duplicate ornaments in the Aztec theater were made with glue molds. The sacrificial stone and the panels in the proscenium arch were executed with waste and glue molds. Large urns and other single objects were made with piece molds. Five large panels were cut out of the cement wall, molds and modeling being dispensed with.

Hannibal Pianta, whose plant made the art objects and panels, has been an artist in plastic cement for many years. He has a large establishment in San Antonio, Pianta,

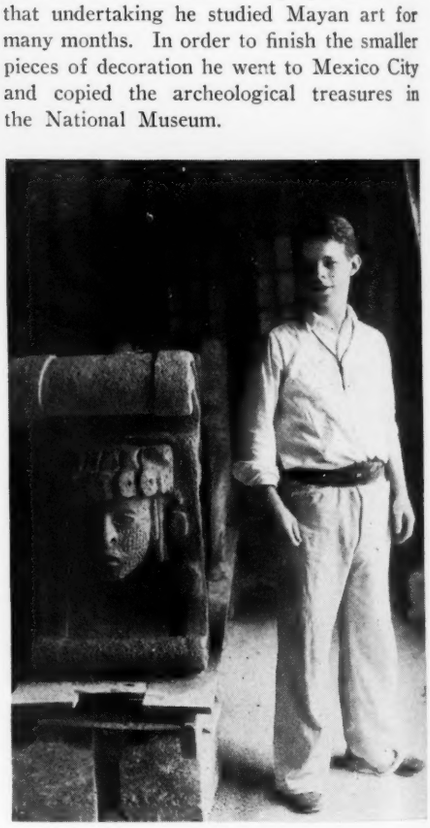
Columns of the temple at Mitla, copied in the Aztec theater. Above the columns are a decorative interpretation of the Aztec goddess of the moon and water

Concrete reproduction of the Aztec corn god

Inc., and furnishes artistic figures in cement for buildings in many cities throughout the country. Following his completion of the concrete art design at the Aztec theater, which is said by many to be his greatest work, he left for Italy for an extended tour of study.

Mr. Pianta had the assistance of Henry Wedemeyer, a young sculptor, who was discovered by Gustav Borglum while that famous artist was working on his model for the "Trail Drivers" monument in San Antonio.

Mr. Wedemeyer assisted Borglum in the work on the model of the "Old Trail Drivers" for a year after which he began the Aztec theater models. In preparation for that undertaking he studied Mayan art for many months. In order to finish the smaller pieces of decoration he went to Mexico City and copied the archeological treasures in the National Museum.



Henry Wedemeyer, sculptor, standing beside an ornamental bench of Aztec design

New Plant of Gonzales Cement Works Now Under Way

PLANS for the new plant which the Gonzales Cement Works, Gonzales, Texas, proposes building at San Antonio, as announced in the January 8 issue of ROCK PRODUCTS are now well under way, according to the Gonzales (Texas) *Inquirer*. The site has been selected, the machinery ordered, and actual construction work will be started immediately.

In line with this development, President A. Neuman of the company announces that the capital stock has been increased from $65,000 to $110,000.

The new plant at San Antonio will be devoted to the manufacture of sewer pipe exclusively. One of the largest capacity concrete pipe machines on the market, which it is said is capable of turning out three carloads of pipe daily, has been ordered by the company. Mr. Neuman also reports that a new 25-hp. motor has just been installed in the Gonzales plant to meet the demands of increased production.

Concrete Building Units Tested by Underwriters' Laboratories

A RECENT test carried out at the Underwriters Laboratories, Chicago, on hollow concrete building tile is said to have proved conclusively their fire resistance. A seven-hour exposure at 1900 deg. F. was used in the test of "Stone-Tile," a form of lightweight concrete block. The test, which will be accepted by insurance companies, showed that the wall prevented the passage of heat to such an extent that combustible materials on the opposite side of the wall failed to ignite for at least seven hours.

In order to make the test especially severe, the wall carried a load of approximately six tons per sq. ft. during the entire test, this being considered by most building codes the maximum allowable for hollow concrete masonry.

The wall, built into a steel frame in which the load was maintained by hydraulic jacks, was swung into place in front of a specially built furnace and the blaze turned against one side of the wall while observers watched the pyrometers, which indicated a rise in temperature and an intensity of heat far greater than would be encountered in anything but the most extraordinary conflagration. Within five minutes from the beginning of the test a temperature of 1,000 deg. was recorded; this had risen in one-half hour to 1,600 deg., and at the end of three hours a temperature of 1,900 deg. was indicated, which was maintained to the end of the test.

To the insurance people the outstanding feature of the test was the slowness with which the temperature rose on the room side of the test wall, and it was not until seven hours had passed that the critical temperature was reached, this being the point at which easily combustible materials are ignited. The average temperature of the room side of the wall, however, was well below the critical point of 300 deg. The wall, the furnace side of which was then practically incandescent, was hauled by men clothed in asbestos out into the open, where it was subjected to a stream of cold water from a standard fire hose to approximate conditions in an actual conflagration.

Next day the pressure of the hydraulic jacks was doubled, increasing the load to double that prescribed by standard building codes, or a total of nearly 12 tons per sq. ft. without effect.—*New York Journal of Commerce.*

Textucco Company Builds New and Larger Plant

ACCORDING to a recent item in the San Antonio (Texas) *Light*, the Textucco Products Manufacturing Co., manufacturers and distributors of exterior and interior finish stuccos and artificial stone, that city, has just completed and moved into new and larger quarters. The new plant is located at 700 San Fernando street on a 1½-acre tract that the company acquired some time ago. It covers 2000 sq. ft. allowing ample room for expansion. It has a capacity, it is said, for turning out one carload of Textucco products every 24 hr., and represents an additional investment of $5000 for equipment alone.

The Textucco company has been operating only since June, 1926, but the business grew so rapidly it was necessary to provide larger quarters to keep up with the demand. Still further expansion will undoubtedly be necessary within the near future, Leo A. Harrison, president of the company, states.

A special feature of the new plant is a display room in the office where actual finished samples of Textucco and artificial marble samples including Roman Prevatine and French core stone are on display. This room is open to the public.

Robert J. Maverick is vice-president and Robert V. Maverick, secretary.

Rodgers Sand Company Plans Expansion in 1927

A RECENT report states that the Rodgers Sand Co., Pittsburgh, Pa., are making plans for a large expansion program for 1927. These are said to include a new sand and gravel unloading plant with complete equipment to be erected at Ridge Avenue. A storage and distributing plant and a large service and garage building will be built at the same place also. The new project, it is estimated, will cost about $250,000 with equipment. Orders for 10 new steel barges to be used for hauling sand and gravel from the company's river plants are expected to be placed within a short time.

The Rodgers company is one of the largest producers in the Pittsburgh district, operating plants at Allegheny, Ambridge, Aspinwall, Bellevue, Cheswick, Duquesne, Pittsburgh and Woodlawn, Pa. The total output of the combined plants is about 1,750,000 tons of washed and screened sand and gravel per year. W. B. Rodgers is president of the company.

Cooper Company to Build New Crushing Plant

A RECENT item in the *Times-Leader* of Wilkes-Barre, Penn., states that the Cooper Crushed Stone Co., Inc., just recently incorporated for $50,000, as announced elsewhere in this issue, has plans already under way for erecting a plant.

The corporation has leased a portion of what is known locally as the orginal William Penn tract located along the Harvey's Creek road, near West Nanticoke, Penn. Work has been started there, it is said, on the erection of bins which will have a capacity of 600 tons, and everything will be rushed through to completion. All the latest and most modern equipment will be installed. It is expected that the plant will be ready to be placed in operation about March 15.

The officers of the new corporation have been announced as follows: George P. Cooper, president and general manager; Myer Friedman, secretary, and Emil Rothman, treasurer. All three are prominent business men in Plymouth.

Purdue Holds Annual Road School

THE thirteenth annual road school under the direction of the School of Civil Engineering, Purdue University, Lafayette, Ind., was recently held at that place. Co-operating with Purdue were the Indiana State Highway Commission, the Indiana State Highway Superintendent's Association, Indiana County Surveyors' and County Engineers' Association, and the City Street Commissioners' Association of the State of Indiana.

Many educational papers were presented by various engineers, officials, contractors and others on the different phases and newest developments in road design, maintenance and construction. Some of the reports presented which were of interest to rock products producers included the following: "Hints on Making Good Concrete," R. B. Creps, assistant professor of testing materials, Purdue University; "County-Owned Gravel Pits," A. E. Simpson and Elmer Blue; "Crushing Oversize Gravel," C. S. Loucks; "Specifications for Road Metal," W. G. Parrett; "Results of Arlington Tests on Thin Paving Brick," L. W. Teller, U. S. Bureau of Public Roads.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.65	1.65	1.40	1.40	1.40
Danbury, Conn.	1.50@2.00	2.00	1.75	1.50	1.35	1.25
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@ .75	1.20@1.30	1.15@1.25	1.10@1.15	1.10@1.15	1.05@1.10
Munns, N. Y.	1.00	1.50	1.50	1.50	1.25	.....
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@1.60	1.40@1.60	.....
Prospect, N. Y.	1.00	1.50	1.40	1.30	1.30	.....
Walford, Penn.	.70	.....	1.35h	.....	.....	.....
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Bloomville, Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.00	1.00	1.00
Buffalo, Iowa	1.10	.....	1.40	1.20	1.25	1.25
Chasco, Ill.	1.00@1.30	.....	1.00@1.15	.....	1.00@1.15	.....
Columbia and Krause, Ill.	1.00@1.50	.90@1.10	1.20@1.35	1.00@1.20	.90@1.20	.....
			Flux 1.50@1.75			
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood and Buffalo, Ia.	1.10	.....	1.30	1.20	1.25	1.25
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Milltown, Ind.	.....	90@1.10	.90@1.15	.90@1.00	.85@.90	.85@.90
River Rouge, Mich.	1.20	1.20	1.20	1.20	1.20	1.20
Montreal, Que.	.75	1.30@1.45	1.15	.90	.85	1.00
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Ont.	1.55	2.05	2.05	1.90	1.90	1.90
Stone City, Iowa	.75	.....	†1.10	1.05	1.00	.....
Waukesha, Wis.	.90	.90	.90	.90	.90	.90
Wisconsin Points	.50	.....	1.00	.90	.90	.....
SOUTHERN:						
Alderson, W. Va.	.50	1.45	1.35	1.25	1.15	1.10
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Brooksville, Fla.	.75	.....	2.65	2.65	2.40	2.00
Chico, Tex.	1.00	1.35	1.25	1.20	1.10	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.50	1.35	1.35	1.20	1.20	.....
Graystone, Ala.			Crusher run, 1.00 per ton			
Kendrick and Santos, Fla.			3½ in. and less, 1.00 per ton			
Ladds, Ga.	.....	.....	1.50	1.35	1.15	.....
New Braunfels, Tex.	.60	1.25	1.10	.90	.90	.90
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.35	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kans.	.25	1.90	1.90	1.90	1.90	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Kansas City, Mo.	.75	1.50	1.50	1.50	1.50	1.50
Rock Hill, St. Louis Co., Mo.	1.40	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.00	.....	1.00	.90	.90	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.55	1.45	1.20	.....
New Haven, New Britain, Meriden and Wallingford, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.70	2.20	2.00	1.60	1.60	.....
Oakland and El Cerito, Cal.	1.00	1.00	1.00	.90	.90	.....
Richmond, Calif.	.50	.....	1.00	1.00	1.00	.....
San Diego, Calif.	.....	2.75	2.55	2.35	2.35	.....
Springfield, N. J.	1.70	2.10	2.10	1.70	1.70	.....
Toronto, Ont.	.....	3.58@4.05	3.05@3.80	.....	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Columbia, S. C.	.75	2.00	1.75	1.75	1.60	1.60
Eastern, Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.	.75	2.00b	1.75	1.40	1.30	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Pa. (sand-rock)	1.85@2.00a	.....	1.35@1.50	.....	1.00@1.50	.....
Toccoa, Ga.	.....	.....	1.40	1.25	1.25	1.25

*Cubic yd. †1 in. and less. ‡Two grades. ‖Rip rap per ton. (a) Sand. (b) to ⅜ in. (c) 1 in., 1.40. (d) 2 in., 1.1¢ (e) Dust. (f) ¼ in. (h) less 10c discount. (i) 1 in., 1.40.

Agricultural Limestone

(Pulverized)

Alderson, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.50
Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh	4.00
Asheville, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton and Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Tex.—50% thru 50 mesh, 2.50; 90% thru 4 mesh	1.75
Colton, Calif.—Analysis 90% $CaCO_3$, bulk	4.00
Cypress, Ill.—90% thru 100 mesh	1.35
Ft. Springs, W. Va.—50% thru 4 mesh	1.50
Millsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh, bags	3.95
Bulk	2.70
(Paving dust)—80% thru 200 mesh, bags	4.25@ 4.75
Bulk	3.00@ 3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.25; bulk	2.75
Joliet, Ill.—90% thru 100-mesh	4.25
Knoxville, Tenn.—80% thru 200 mesh, 3.00; 80% thru 100 mesh, bags, 3.95; bulk	2.70
Ladds, Ga.—Analysis, $CaCO_3$, 58%; $MgCO_3$, 32%; pulverized; 50% thru 50 mesh	1.50@ 2.50
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Middlebury, Vt.—99% thru 50 mesh, 50% thru 200 mesh	2.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Aqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 95%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Syracuse, N. Y.—Analysis, 89% $CaCO_3$; $MgCO_3$, 4%; bags, 4.25; bulk	2.75
Toledo, Ohio, 30% through 50 mesh	2.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.30
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50
West Stockbridge, Mass.—Analysis 90% $CaCO_3$, 50% thru 100 mesh; cloth bags, 4.75; paper, 4.25; bulk	3.25

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 10 mesh	1.50
Brandon and Middlebury, Vt.—Pulverized, bags, 5.50; bulk	3.50

(Continued on next page)

Agricultural Limestone

Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.75
50% thru 4 mesh	1.50
Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh	.80
Columbia, Krause, Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 90% thru 4 mesh	1.35
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	1.35
Danbury, Conn.—Analysis, 81 to 85% $CaCO_3$	3.75@ 4.75
Dundas, Ont.—Analysis, 53.8% $CaCO_3$; $MgCO_3$, 43.3%; 50% thru 50 mesh	1.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	.75
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@ 2.35
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% $CaCO_3$, 54% $MgCO_3$; meal, 25 to 45% thru 100 mesh	1.60
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Monroe, Mich. — Analysis, $CaCO_3$, 52.03%; 42.25% $MgCO_3$; 30% thru 100 mesh	2.30
Mountville, Va. — Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh bags	5.50
Pixley, Mo.—Analysis, 96% $CaCO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes	1.25

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill. — Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh; (for mine dusting and asphalt filler)	3.50
Piqua, Ohio, sacks, 4.50@5.00 bulk	3.00@ 3.50
Rocky Point, Va.—82% thru 200 mesh, 2.50@3.50 bulk, paper bags	3.75@ 4.75
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Berkeley Springs, W. Va.	2.00@ 2.25
Buffalo, N. Y.	2.00@ 2.50
Cedarville and S. Vineland, N. J.—Damp	1.75
Dry	2.25
Columbus, Ohio	1.00@ 1.50
Estill Springs and Sewanee, Tenn.	1.50
Gray Summit and Klondike, Mo.	1.75@ 2.00
Los Angeles, Calif.—Washed	5.00
Mapleton Depot, Penn.	2.25@2.50
Massillon, Ohio	3.00
Mendota, Va.	2.25@ 2.50
Mineral Ridge and Ohlton, Ohio	2.50
Oceanside, Calif.	3.00
Ottawa, Ill.	.75@ 1.25
Pittsburgh, Penn.	3.00@ 4.00
Ridgway, Penn.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.00
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.25@ 2.50
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Thayers, Penn.	2.50
Utica, Ill.	.90

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Columbus, Ohio		.30@ 1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	.65@ 1.25
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40			2.25	2.25
Erie, Pa.		1.00*		1.50*	1.75*	
Farmingdale, N. J.		.48	.75	1.20	1.10	
Hartford, Conn.	.65*					
Leeds Junction, Me.		.50	1.75		1.35	1.25
Machias Jct., N. Y.	.75	.75	.85	.75	.75	.75
Montoursville, Penn.	1.00	1.00	1.00	.90	.90	.90
Northern New Jersey	.40@ .50	.40@ .50	1.25	1.25	1.25	
Portland, Me.	1.50	1.50	2.75		2.50	
Shining Point, Penn.			1.00	1.00	1.00	1.00
Somerset, Penn.		2.00				
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.	.85	.85	1.70	1.50	1.30	1.30
York, Penn.	1.10	1.00				
CENTRAL:						
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Appleton and Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Attica, Ind.			All sizes .75@.85			
Aurora, Oregon, Sheridan, Moronts, Yorkville, Ill.	.60	.50	.40	.50	.60	.55
Barton, Wis. (f)		.50		.75	.75	.75
Chicago district, Ill.	.70	.55	.55	.60	.60	.60
Columbus, Ohio		.70	.70	.70	.70	
Des Moines, Ia.		.30	1.40	1.40	1.50	1.50
Eau Claire, Wis.	.65@1.25	.45	.80	.95	.95	
Elkhart Lake, Wis.	.60	.50	.60	.60	.60	
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Grand Haven, Mich.		.60@ .70		.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50		.80	.70	.70
Hamilton, Ohio	.80@1.00	.80@1.00	.80@1.00		.80@1.00	.80@1.00
Hersey, Mich.		.50				.70
Humboldt, Iowa	.50	.50	1.50	1.50	1.50	1.50
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Joliet, Plainfield and Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50	.50	1.45	1.45	1.35	1.35
Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Mattoon, Ill.	.75@ .85	.60@ .85	.85	.85	.85	.85
Milwaukee, Wis.		1.01	1.21	1.21	1.21	1.21
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.40@ .60	.40@ .60	1.25	1.25	1.25	1.25
Pittsburgh, Penn.	1.25	1.25	.85	.85	.85	.85
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	.83	1.45	1.55	1.45	1.45	1.45
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.25	1.15
Zanesville, Ohio		.60	.50	.60	.80	
SOUTHERN:						
Charleston, W. Va. (b)			All sand, 1.40. All gravel, 1.40			
Brewster, Fla.	.60	.60	2.25g			
Chattahoochie River, Fla.		.70		1.75		
Eustis, Fla.		.60@ .70				
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Knoxville, Tenn.	1.25	1.25		1.20	1.20	1.20
Lindsay, Texas					.55	
Macon, Ga.		.50		.90	.90	
New Martinsville, W. Va.	1.00	.90@1.00		1.20@1.30		.80@ .90
Roseland, La.	.50	.50	2.25	1.25	1.00	1.00
WESTERN:						
Kansas City, Mo.		.70				
Los Angeles, Calif.	.50	.50	1.10	1.10		1.10
Oregon City, Ore.		1.50*	1.50*	1.50*	1.50*	1.50*
Phoenix, Ariz.	1.25*	1.25*	2.50*	2.00*	1.75*	1.50*
Pueblo, Colo.	.80	.65		1.25		1.15
San Diego, Calif.	.65@ .75	.65@ .75	1.50	1.30	1.10	1.10
Seattle, Wash. (bunkers)	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Chicago district, Ill.	.35					.65@1.00
Ferrysburg, Mich.						
East Hartford, Ohio	.75*					.55
Gainesville, Texas						
Grand Rapids, Mich.				.55		
Hamilton, Ohio					.55@ .65	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Joliet, Plainfield and Hammond, Ill.	.35	1.25				
Macon, Ga.	.40					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Ottawa, Oregon, Moronts and Yorkville, Ill.			Ave. .60 per ton all sizes			
Roseland, La.					.65	
Somerset, Penn.		1.85@2.00		1.50@1.75		
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

(a) ⅝ in. down. (b) River run. (c) 2½ in. and less.
*Cubic yd. †Include freight and bunkerage charges and truck haul. ‡Delivered on job by truck.
(d) Less 10c per ton if paid E.O.M. 10 days. (e) pit run. (f) plus 15c winter loading charge.
(g) ¾-in. and less.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	3.00	2.75	3.00	1.75		4.50	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75@2.25	1.75@2.25		1.75	2.00@2.50		1.75@2.00
Buffalo, N. Y.	1.50	1.50		2.00@2.50			
Columbus, Ohio	1.25@2.00	1.25@1.75	2.00@2.50	.30@1.50	2.00@2.50	2.75@3.50	1.50@3.00
Dresden, Ohio	1.50@1.75	1.50	1.75	1.25			
Eau Claire, Wis.						3.00	
Elco, Ill.	Ground silica per ton in carloads—18.00@31.00						
Elnora, N. Y.			1.75				
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		2.00			
Klondike, Mo.	1.75@2.00		1.75@2.00	1.75@2.00	1.75@2.00		1.75
Mapleton Depot, Pa.	2.25			2.00	2.00	2.00	
Massillon, Ohio	2.25	2.25		2.25	2.50		
Mendota, Va.	Ground flint or silex—16.00@20.00 per ton						
Michigan City, Ind.				.30	.30		
Millville, N. J.				1.75b		3.50	
Montoursville, Penn.				1.25@1.50			
New Lexington, O.	2.75	2.25					
Ohlton, Ohio	1.80b	1.80b		2.00b	1.75b	1.75b	
Ottawa, Ill.			2.50	1.25	.75	3.50	3.00
Ridgeway, Penn.	1.50	1.50					
Round Top, Md.	1.25			1.60		2.25	
San Francisco, Calif.	3.50	4.75	3.50	3.50@5.00	3.50@4.50	3.50@5.00	
Silica, Va.				10.00@16.00			
Thavers, Penn.	1.25	1.25		2.00			
Utica, Ill.	.50@1.00	.50@1.00	.50@1.00	.55@ .90	.60@1.00	3.00@3.25	.90@3.25
Utica, Ill.	.65	.70		.75	.90		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	*1.75@2.25	*1.75@2.25	2.25	*1.75@2.25	2.25		
Zanesville, Ohio	2.00‡	1.50‡	2.00‡	2.00	2.00		

*Green. †Crude silica, crushed and screened, not washed or dried. ‡Plus 75c per ton for winter loading. ¶Crude. §Crude and dry. (a) Delivered. (b) Damp.

Crushed Slag

City or shipping point EASTERN:	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in and less	2½ in. and less	3 in. and larger
Buffalo, N. Y., Emporium and Dubois, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.75		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.75*	1.45*	1.30*	1.45*	1.45*
Jackson, Ohio		1.05*		1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.55*		1.55*	1.55*	1.55*	1.55*
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruessens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.15e
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95d
Chazy, N. Y.	12.50	10.50	8.00	12.00	11.50	16.50	10.00	2.50₂
Lime Ridge, Penn.					5.00a			
West Stockbridge, Mass.	12.00	10.00	5.60					2.00t
Williamsport, Penn.			10.00				6.00	
York, Penn.		9.50	9.50	10.50	8.50	10.50	8.50	1.65i
CENTRAL:								
Afton, Mich.							8.50	1.35
Carey, Ohio	12.50	8.50	8.00		9.00		8.00	2.00
Cold Springs, Ohio		8.50	8.50				8.00	
Delaware, Ohio		8.50	8.50	9.50	8.25₇	14.03₇	7.50	1.50c
Frederick, Md.		10.00	10.00	10.00	8.50	10.00	7.00	
Gibsonburg, Ohio	12.50	8.50	8.50		9.00	11.00	8.00	
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio	12.50							
Marblehead, Ohio		8.50	8.50		9.00		8.00	1.50w
Marion, Ohio		8.50	.850				8.00	1.70d
Milltown, Ind.		9.00@10.00		10.00p			8.50q	1.40r
Sheboygan, Wis.	11.50						9.50	.95
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50				9.00	11.00	8.00	
Wisconsin points (f)		11.50					9.50	
Woodville, Ohio	12.50	8.50	8.50	13.50	9.00	11.00	9.00	1.50
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Texas.							8.50	1.50
Graystone, Ala.	12.50	10.00					8.50	1.50
Keystone, Ala.		10.00	10.00	10.00	8.50			1.50
Knoxville, Tenn.	20.00	10.00	9.00	9.00	8.50	1.35	8.00	1.50
Longview, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
New Braunfels, Tex.	18.00	12.00	10.00	12.00	10.00		9.50	
Ocala, Fla.	14.00	13.00	12.00	13.00			12.00	1.70
Saginaw, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
WESTERN:								
Kirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Dittlinger, Tex.		12.00@13.00					9.50p	1.50,
San Francisco, Calif.	21.00	19.00	16.50				14.00	2.00
Tehachapi, Calif.			8.00				13.00z	2.20x
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

†50-lb. paper bags; (a) run of kilns; (c) wooden, steel 1.70; (d) steel; (e) per 180-lb. barrel; (f) dealers' prices, net 30 days less 25c disc. per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days; (i) 180-lb. net barrel, 1.65; 280-lb. net barrel, 2.65; (p) to 11.00; (q) to 8.75; (r) to 1.50; (s) in 80-lb. burlap sacks; (t) to 3.00; (u) two 90-lb. bags; (v) oil burnt; wood burnt 2.25@2.50; (w) wood, steel 2.30; (z) to 15.00; (*) quoted f.o.b. New York; (‡) paper bags; (w) to 1.50 in two 90-lb. bags, wood bbl. 1.60; (¶) to 10.00; (₁) 80-lb. paper bags; (₂) to 3.00; (₃) to 9.00; (₄) to 1.60. (₅) to 16.00; (₆) wood bbl., steel, 1.80; (₇) quoted f.o.b. Marble Cliff, Ohio.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Mapleton Depot, Penn.		2.00@ 2.25
Massillon, Ohio		2.25
Michigan City, Ind. (Engine sand)		.15@ .25
Mineral Ridge, Ohio	*1.75@ 2.00	*1.75
Montoursville, Penn.		1.25
Ohlton, Ohio	1.80	1.80
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.25
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50@ 4.50	3.50@ 4.50
Thayers, Penn.		2.25
Utica, Ill.	.90@ 3.25	.90
Warwick, Ohio	2.25	2.25
Zanesville, Ohio		2.50

*Wet.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel worker's crayons, per gross	1.00@ 1.50
Chatsworth, Ga.:	
Crude Talc	5.00
Ground (150-200 mesh), bulk	10.00
Pencils and steel worker's crayons, per gross	1.00@ 2.00
Chester, Vt.:	
Ground talc (150-200 mesh), bulk	9.00@10.00
Including bags	10.00@11.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc	5.00
Ground talc (150-200) bags	10.00@12.00
Pencils and steel workers' crayons, per gross	1.00@ 1.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) including bags, 300-350 mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.00
Ground talc (150-200 mesh), bulk	7.75@14.00
Joliet, Ill.:	
Roofing talc, bags	12.00
Ground talc (200 mesh), bags	30.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (125-200 mesh), bags	10.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 68-72%..	3,75@ 4.25
Mt. Pleasant, Tenn.—B.P.L. 75%	5.50@ 6.00
Tennessee—F.O.B. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00

Ground Rock

(2000 lbs.)

Centerville, Tenn.—B.P.L. 65%	7.00
Gordonsburg, Tenn.—B.P.L. 68-72%	4.00@ 5.00
Mt. Pleasant, Tenn.—B.P.L. 65%	8.00@10.00
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton.)

Florida—F. O. B. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, F.O.B. plant or nearest shipping point.

Franklin, N. C.—	
Mine scrap, per ton	12.00
Clean shop scrap, per ton	16.00
Punch mica, per lb.	.05
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—per ton,	
Mine run	360.00
Clean shop scrap	25.00
Mine scrap	22.00
20 mesh	32.00
60 mesh	45.00
100 mesh	60.00
Roofing mica	36.00
Punch mica, per lb.	.12

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars		10.50
Brandon, Vt.—English pink, English cream and coral pink	*11.00	*11.00
Brandon grey	*11.00	*11.00
Brighton, Tenn.—Pink..	6.00	5.00
Mixed pink and bronze	4.50@ 6.00	4.50@ 6.00
All colors, mixed sizes	3.50	3.50
Buckingham, Que.—Buff stucco dash		12.00@14.00
Chicago, Ill. — Stucco chips, in sacks f.o.b. quarries		17.50
Crown Point, N. Y.—Mica Spar		8.00@10.00
Dayton, Ohio		6.00@24.00
Easton, Penn., and Phillipsburg, N. J.	12.00@16.00	12.00@16.00
Haddam, Conn. — Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash		6.00@16.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50
Milwaukee, Wis.		14.00@34.00
Newark, N. J.—Roofing granules		7.50
New York, N. Y.—Red and yellow Verona		32.00
Red Granite, Wis.		7.50
Stockton, Calif. — "Natrock" roofing grits		12.00@15.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	
Wauwatosa, Wis.		22.00@32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00

†C.L. L.C.L. 17.00.
*C.L. including bags; L.C.L. 14.50
‡C.L. including bags, L.C.L. 10.00.

Potash Feldspar

Auburn and Brunswick, Me.—Color, white; 98% thru 140 mesh bulk 19.00

Buckingham, Que.—Color, white; analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk 9.00

De Kalb Jct., N. Y.—Color, white; bulk (crude) 9.00

East Hartford, Conn.—Color, white, 95% through 60 mesh, bags 16.00
96% thru 150 mesh, bags 30.00

East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk 19.35
Soda feldspar, crude, bulk, per ton 22.00

Erwin, Tenn.—Color, white; analysis, 12.07% K_2O, 19.34% Al_2O_3; Na_2O, 2.92%; SiO_2, 64.76%; Fe_2O_3, .36%; 98.50% thru 200 mesh, bags, 16.90; bulk 15.50

Glen Tay Station, Ont., color, red or pink; analysis: K_2O, 12.81%, crude (bulk) 7.00

Keystone, S. D.—Prime white, bulk (crude) 8.00

Los Angeles, Calif. — Color, white; analysis, K_2O, 12.16; Na_2O, 1.53; SiO_2, 65.60; Fe_2O_3, .10; Al_2O_3, 19.20; crude 10.05@11.55
Pulverized, 95% thru 200 mesh; bags, 22.00@23.50; bulk 20.00

Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk 20.00

Penland, N. C.—Color, white; crude, bulk 8.00
Ground, bulk 16.50

Spruce Point, N. C., and Bristol, Tenn.—Color, white; 90% thru 200 mesh, bulk 12.50@20.00

Tenn. Mills—Color, white; analysis K_2O, 18%; Na_2O_3, 10%; 68% SiO_2; 99% thru 200 mesh; bulk 18.00
99% thru 140 mesh, bulk 16.00

Topsham, Me.—98% thru 140 mesh, bulk 19.00

Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude 7.50@ 8.00

Blended Feldspar
(Pulverized)

Tenn. Mills—Bulk 16.00@20.00

Chicken Grits

Afton Mich. (limestone) per ton 10.00

Belfast and Rockland, Me.—(Limestone), bags, per ton ‡10.00

Brandon and Middlebury, Vt., per ton 10.00

Cartersville, Ga.—(Limestone), per bag 2.00

Centerville, Iowa (gypsum) per ton 18.00

Chico, Texas (limestone), 100 lb. bags, per ton 8.00@ 9.00

Danbury, Conn. (limestone) 7.00@ 9.00

Easton, Penn.—Per ton, bulk 3.00

Joliet, Ill.—(Limestone), bags, per ton 4.50

Knoxville, Tenn.—per bag 1.00

Los Angeles, Calif. (feldspar) per ton 17.85

Gypsum, Ohio.—(Gypsum) per ton 10.00

Limestone, Wash. (limestone) per ton 12.50

Rocky Point, Va. (limestone) 100 lb. bags, 50c; sacks, per ton, 6.00 bulk 5.00

Seattle, Wash.—(Limestone), bulk, per ton 12.00

Warren, N. H.—(Mica) per ton 3.85@ 3.90

Waukesha, Wis.—(Limestone), per ton 8.00

West Stockbridge, Mass.—(Limestone) bulk 7.50@9.00*

Wisconsin Points (limestone) per ton 9.00

*L.C.L.
†Less than 5-ton lots.
‡C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Anaheim, Calif. 10.50@11.00
Barton, Wis. 10.50@13.00b
Boston, Mass. *17.00
Brighton, N. Y. *19.75
Dayton, Ohio 12.00@13.50
Detroit, Mich. *17.50
Farmington, Conn 13.00
Grand Rapids, Mich 12.00
Hartford, Conn. *19.00
Jackson, Mich. 13.00
Lakeland, Fla. 10.00@11.00
Lake Helen, Fla. 10.00@15.00
Lancaster, N. Y. 12.50
Madison, Wis. a12.50
Michigan City, Ind. 11.00
Milwaukee, Wis. *13.00
Minneapolis and St. Paul, Minn. 13.00
Minnesota Transfer 10.00
New Brighton, Minn. 10.00
Pontiac, Mich. 12.00@13.50
Portage, Wis. 15.00
Prairie du Chien, Wis. 18.00@22.50
Rochester, N. Y. *19.75
Saginaw, Mich. 13.00
San Antonio, Texas 16.00
Sebewaing, Mich. 12.00
Sioux Falls, S. Dak. 13.00c
Syracuse, N. Y. 16.00@18.00*
Toronto, Canada 15.60†
Toronto, Canada 12.60
Wilkinson, Fla. 10.00@12.00

*Delivered on job. †Delivered in city.
‡Less 5%. ¶Dealers' price. (a) Less .50 E.O.M. 10 days. (b) Delivered to Milwaukee. (c) Delivered at yard.

Portland Cement

Prices per bag and per bbl, without bags net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.	.....	2.35
Baltimore, Md.	.....	2.25
Birmingham, Ala.	.....	2.30
Boston, Mass.	.63¼	2.53
Buffalo, N. Y.	.59½	2.38
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	.....	2.24‡
Charleston, S. C.	.....	2.35
Cheyenne, Wyo.	.82¾	3.31
Cincinnati, Ohio	56¾	2.37‡
Cleveland, Ohio	.....	2.29‡
Chicago, Ill.	.....	2.10‡
Columbus, Ohio	.....	2.34
Dallas, Texas	.....	2.10
Davenport, Iowa	.....	2.29‡
Dayton, Ohio	.....	2.38
Denver, Colo.	.66¼	2.65
Detroit, Mich.	.....	2.15
Duluth, Minn.	.....	2.09‡
Houston, Texas	.....	2.60
Indianapolis, Ind.	.....	2.29‡
Jackson, Miss.	.....	2.60
Jacksonville, Fla.	.....	2.20
Jersey City, N. J.	.....	2.23
Kansas City, Mo.	.....	1.92
Los Angeles, Calif.	.60@.64†	.....
Louisville, Ky.	.54¼	.....
Memphis, Tenn.	.....	2.60
Milwaukee, Wis.	.....	2.25‡
Minneapolis, Minn.	.....	2.22‡
Montreal, Que.	.....	1.36
New Orleans, La.	.....	2.20
New York, N. Y.	.53¾	2.15
Norfolk, Va.	.....	2.17
Oklahoma City, Okla.	.....	2.46
Omaha, Neb.	.....	2.36
Peoria, Ill.	.....	2.27‡
Philadelphia, Penn.	.....	2.31
Phoenix, Ariz.	.81½	3.26
Pittsburgh, Penn.	.....	2.09‡
Portland, Colo.	.....	2.80
Portland, Ore.	.63¾	2.55
Reno, Nevada	.....	2.91
Richmond, Va.	.....	2.44
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.	.....	2.31
Savannah, Ga.	.....	2.50
St. Louis, Mo.	.55	2.20
St. Paul, Minn.	.....	2.22‡
Seattle, Wash.	.....	2.65
Tampa, Fla.	.....	2.25
Toledo, Ohio	.....	2.20‡
Topeka, Kans.	.....	2.41
Tulsa, Okla.	.....	2.33
Wheeling, W. Va.	.....	2.17
Winston-Salem, N. C.	.....	2.78

NOTE—Add 40c per bbl. for bags.
†Delivered on job in any quantity, sacks extra.
‡Ten cents discount for cash, 15 days.

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Buffington, Ind.	.....	1.85
Chattanooga, Tenn.	.....	2.45*
Concrete, Wash.	.....	2.35
Davenport, Calif.	.....	2.05
Detroit, Mich.	.....	2.15
Hannibal, Mo.	.....	1.85
Hudson, N. Y.	.....	1.95
Leeds, Ala.	.....	1.95
Mildred, Kans.	.....	2.35
Nazareth, Penn.	.....	1.95
Northampton, Penn.	.....	1.85
Richard City, Tenn.	.....	2.05
Steelton, Minn.	.....	1.90
Toledo, Ohio	.....	2.20
Universal, Penn.	.....	1.85

*Including sacks at 10c each.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ½x32x 36". Wt. 1500 lb. Per M Sq. Ft.	½x32x 36". Wt. 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lgths 6'-10', 1850 lb. Per M Sq. Ft.
Arden, Nev. and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Ia.	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	8.00	.....	8.25@9.40	.....	.....	.14½s	.15½s	40.00@41.0c
Douglas, Ariz.	.....	.....	7.00	.....	.....	15.50d	18.50	.....	30.00	15.50	.....	.....	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio‡	3.00	4.00	6.00	7.00	9.00	9.00	19.00	7.00	25.00	20.00	.....	15.00	30.00
Los Angeles, Calif.	.....	.....	.....	8.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	11.65m	13.40r	14.40r	.....	15.40r	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.00	11.00	11.00	13.00‡	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
*To 3.00; †to 11.00; ‖to 12.00; ‡prices per net ton, sacks extra; (a) to 25.00; (b) net; (c) gross; (d) hair fibre; (f) delivered; (h) delivered in six states; (i) delivered on job; (k) sacks 12c extra, rebated; (m) includes paper bags; (o) includes jute sacks; (r) including sacks at 15c; (s) per board; (t) to 16.50; (u) includes sacks; (v) F.O.B. N. Y. C. and dealers yard in mill locality.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City of shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	.16@.18a	.....	.....
Detroit, Mich.	.16	.....	.18
Forest Park, Ill.	18.00*	23.00*	30.00*
Grand Rapids, Mich.	12.00	.....	.....
Graettinger, Iowa	.18@.20	.....	.....
Indianapolis, Ind.	.13@.15†	.....	.....
Los Angeles, Calif.¶	5¾x3½x12—55.00	7¾x3½x12—65.00	
Oak Park, Ill.	18.00@40.00¶	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.20@.25	.....	.....
Tiskilwa, Ill.	.16@.18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton.

Cement Roofing Tile

Prices are net per sq. in carload lots, f.o.b. nearest shipping point unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00

Chicago, Ill.—per sq. 20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red and Orange	Green Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35
*End bands	.25	.35
*Eave closers	.06	.08
*Ridge closers	.05	.06

*Used only with Spanish tile.
†Price per square.

Houston, Texas.—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich	Per 1000
5x8x12	55.00
Detroit, Mich.	Per 100
5x4x12	4.50
5x8x12	8.00
Longview, Wash.	Per 1000
4x6x12	52.00
4x8x12	64.00
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Grand Rapids, Mich.:	Per 100
5x8x12	7.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone-Tile)	Per 100
3½x4x12	3.00
3½x6x12	4.50
3½x8x12	6.00
Tiskilwa, Ill.—8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile)	Per 1000
3½x6x12	50.00
3½x8x12	60.00

Prairie du Chien, Wis.	14.00	22.50@27.00
Yakima, Wash.—Building tile:		
5x8x12		.10

Cement Drain Tile

Graettinger, Iowa—5 to 36 in., per ton	8.00
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Longview, Wash.	18.00	25.00@75.00
Milwaukee, Wis.	15.00	25.00@75.00
Mt. Pleasant, N. Y.		14.00@23.00
Omaha, Neb.	18.00	30.00@40.00
Pasadena, Calif.	11.00	
Philadelphia, Penn.	15.00	20.00
Portland, Ore.	17.50@21.00	25.00@55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	23.00
Rapid City, S. D.	18.00	25.00@80.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	15.00	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	

†Gray. ‡Red.

Two Indiana Cement Products Plants Merge

A RECENT item in the Indianapolis (Ind.) *Star* announces the sale of the California Stucco Products Co. of Indianapolis, 54th street and the Monon railroad, to the Gibraltar Cement Block Co., 1441 South Harding street, for a consideration of $10,000. The stucco products plant was sold by the trustees of the R. H. Shelhorn Co., the former owners. J. G. Praed is president of the Gibraltar company.

The stucco plant, with machinery and equipment, is now being moved, it is said, from the 54th street site to the cement plant on Harding street, where it will be housed in newly erected buildings. Mr. Praed announced that, in addition to the machinery and equipment obtained from the stucco products plant, new machinery will be installed immediately to facilitate increased production. The Gibraltar plant, which is said to be the largest cement block company in Indiana, moved into its new plant last year.

The Gibraltar company, according to Mr. Praed, plans the manufacture of the stucco product on a large scale. More than 200 homes in Indianapolis have used the product as building material since its introduction into the state. The process for its manufacture was formulated in California a few years ago and patent rights purchased by R. H. Shelhorn. Mr. Praed, in addition to the purchase of patent rights, is said to have also obtained all material on hand and machinery in the old plant. The product is being manufactured now in more than 100 distinct shades.

New Concrete Pole Plant

THE Rochester Gas and Electric Corp., Rochester, N. Y., has placed a contract for the construction of a new concrete pole casting plant with the Austin Co., Cleveland, Ohio, in order to maintain an adequate supply of concrete poles.

The Rochester Gas and Electric Corp. is now using concrete poles exclusively. The new plant unit will be 60x120 ft. Plans call for wooden bins for sand and gravel storage and a 2-ton crane for handling the finished product. The building is to be completed by about February 1.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted.

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Graettinger, Iowa	.04½d	.05½	.08½	.12½	.17½	.....	.40	.50	.60	.70	.....	.....	.....	.....	.....	.....	.....
G'd Rapids, Mich. (b)																	
Culvert pipe	.....	.....	.....	.60	.72	1.00	1.28	1.60†	.....	1.92	2.32	3.00	4.00	5.00	6.00	.....	.....
Sewer pipe	.11	.15	.25	.29	.38	.59	1.00	1.26†	.....	1.89	.....	.....	.....	.....	.....	.....	.....
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	†1.70	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.								Sewer pipe 40% off list, culvert—list									
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.								6 in. to 24 in., $18.00 per ton									
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.								12.00 per ton									
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tacoma, Wash.	.15	.18	.22	.30	.40	.60	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tiskilwa, Ill. (rein.) (a)	.....	.....	.....	.65	.75	.85	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Yakima, Wash.								$10.00 per ton									

*30-in. lengths up to 27-in. diam., 48-in. lengths after; (a) 24-in. lengths; (b) Reinforced; (c) Interlocking bar reinforced.
†21-in. diam. ‡Price per 2 ft. length. (d) 5 in. diam. [1]@1.08 [2]@1.25. [3]@1.65. [4]@2.50. [5]@3.85. [6]@5.00. [7]@7.50.

Road Builders Convention at Chicago Breaks All Records

THE 24th annual convention of the American Road Builders' Association held in Chicago, January 10 to 14, inclusive, probably surpassed anything of its kind ever held and was attended by highway officials, engineers, contractors and machinery manufacturers of the United States and from many foreign countries. Charles M. Upham, business director of the association, who managed the show, was assisted by various committees appointed by Henry G. Shirley, president.

The convention program committee, in charge of H. K. Bishop of the U. S. Bureau of Public Roads, arranged for individual meetings of the engineers and contractors at which the particular problems affecting these groups were fully discussed.

The convention was opened at the Palmer House on Tuesday, January 11, by an address from President Shirley in which he stressed some of the more important problems such as increase in federal aid, a tax on gasoline, issuance of licenses for the life of a car and proper control of traffic over highways, and the need and demand for more improved highways, as well as widening and improvements of those already built.

Prominent Speakers Address Convention

Gov. Len Small of Illinois, who followed Mr. Shirley, told the delegates that all that is possible will be done to push at least 1000 miles of new hard roads in Illinois to completion during 1927.

T. Warren Allen, chief of the division of control, United States Bureau of Public Roads, told the delegates that scientific study of construction methods has brought out new machines, new systems and many other smaller items, all of which have in many instances resulted in contractors finishing work ahead of schedules.

Other speakers were George F. Schlesinger, director of the Ohio Department of Highways and Public Works; H. E. Breed, consulting engineer, New York City; Judge Woolsey Finnell, Tuscaloosa, Ala.; A. J. Parrish, president Illinois Association of Highway and Municipal Contractors; J. H. Ellison of Minneapolis, president, Associated General Contractors of America; A. E. Horst of the Henry W. Horst Co., Rock Island, Ill., and Charles H. Burras of Chicago, president, National Association of Casualty and Surety Agents.

Pan-American Countries Well Represented

The following day, Wednesday, was Pan-American day at the convention and was featured by addresses from delegates from South America, Central America, Alaska and Canada who were in attendance. Among the speakers were Dr. Andres Ortiz, department of communications, Mexico City; Benjamin Gonzales Cohen, secretary to the Chilean embassy; Dr. Manuel Alberto Corcalle, of the public works department, Havana, Cuba, and Dr. Arietta Gallegos, a delegate from San Salvador.

The entire afternoon session was given over to discussions of engineers' and contractors' problems. Included among the speakers at the engineers session were Cyrus S. Avery, chairman, Oklahoma department of highways; B. H. Piepmeier, chief engineer, Missouri state highway commission; Leslie R. Ames, acting state highway engineer, North Carolina state highway commission; H. S. Mattimore, engineer of tests and materials investigation, Pennsylvania department of highways, and F. E. Kelly, acting chief, division of tests, U. S. Bureau of Public Roads.

New Officers Elected

The annual banquet was held on Wednesday evening in the grand ballroom of the Palmer House. Wilbur Nesbit, official of the Chicago Association of Commerce, was toastmaster of the banquet.

The following officials were elected: C. M. Babcock, St. Paul, president; W. A. Van Duzer, Harrisburg, Pa., Pennsylvania highways department, F. Beatty, Chicago, vice-president, Austin-Western Road Machinery Co., S. T. Henry, Spruce Pine, N. C., Samuel Hill, Seattle, Wash., Washington State Good Roads Association, vice-presidents; James H. MacDonald, New Haven, Conn., treasurer.

The final day of the convention was featured by addresses from many officials of various state highway departments. Among these were Dr. F. A. Hathaway, chairman of the Florida state highway department; Frank T. Sheets, chief highway engineer of the Illinois division of highways; Thomas H. MacDonald, chief of the U. S. bureau of public roads; W. H. Connell, engineering executive, Pennsylvania department of highways; General James G. Steese, commissioner of public works, Juneau, Alaska; J. E. Ellison, Minnesota state highway department, and A. W. Brandt, commissioner of highways, New York.

Great Display of Machinery

Many prominent manufacturers of machinery displayed their products in the Coliseum and the adjoining building. Great interest in the newest and modern equipment was quite evident by the way the exhibition rooms were crowded during all hours of the day. It is believed that the exhibit was the most extensive ever held, surpassing even that of last year, when over $3,000,000 worth of equipment was shown.

Fifty Years of Material Handling Service

IN 1877 the Jeffrey Manufacturing Co., Columbus, Ohio, began the manufacture of a machine for cutting coal mechanically, on which new types of chain for power transmission were used. That machine, the first practical coal cutter, was destined to revolutionize the coal mining industry and opened the way for the development of chains for many other industrial uses.

At about the same time a member of the company then known as the Columbus Rolling Mills came to the little one-room workshop of the Jeffrey company. Noticing several pieces of malleable roller and steel thimble roller chain laying on the floor, he inquired if they might not be used as a drive for the feed rolls in their mill.

These chains had been designed for use as drives on Jeffrey coal cutters; however, it was found that they worked equally well on the feed rolls. From this humble beginning the chain department of the Jeffrey company grew rapidly, and these two chains were soon being used for bucket elevators, conveyors and drives in several industries.

The power transmission problem of stern wheel steamers on the Mississippi river added impetus to the development of chain business. Rubber belts had been used, but belts were susceptible to stretching, slipping and weather deterioration. Two of the first companies to use Jeffrey chain drives on their river boats were the Pittsburgh Plate Glass Co. and the Mobile firm, Mahler, Bell and Ollinger.

Various companies in industries where materials were moved frequently between processes had been experimenting with several types of conveyors. These were principally rope with cross-flights for pushing the material, but they were not entirely satisfactory.

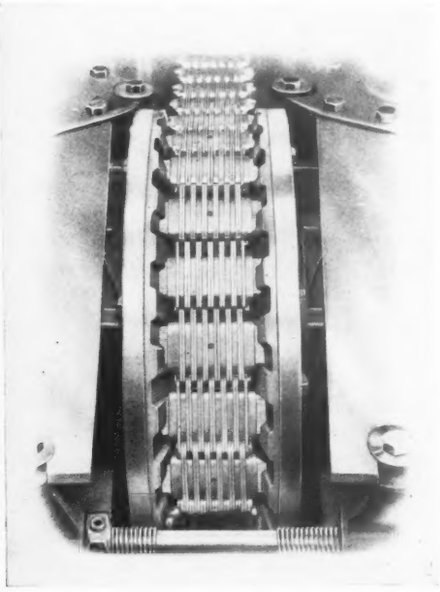
Simple chain attachments were soon developed to carry the flights and a new era in conveyors had begun. Other types of chains and conveyors were the natural development. Perhaps the earliest use of Jeffrey conveyors was by canning companies for handling fruits and vegetables and in strawboard plants as straw conveyors. As early as 1886 the Portage Strawboard Co. had in use over two miles of Jeffrey roller chain.

In celebrating its golden anniversary, the Jeffrey Manufacturing Co. is to be congratulated on its numerous contributions to material handling progress. Material handling is an important factor in practically every industry. Developing machinery to handle materials mechanically has made possible a continuous flow of materials through the processes of manufacture which is so vital to quantity production; with the heavier handling tasks lifted from its shoulders, labor is happier and able to increase its earnings; and while production has increased manyfold, it has been possible in many cases to greatly lower the unit cost.

New Machinery and Equipment

New Variable Speed Device

ONE of the greatest advances in the mechanical transmission of power is said to be embodied in a new device recently developed by David Brownlie, London, England. Through the use of this machine, called the "P. I. V." (Positive Infinitely Variable) gear, it is claimed that an infinite number of speed variations can be given to a driven shaft from a driving shaft with truly positive transmission at any centers by merely making adjustments at a simple handle or lever. Through the "P. I. V." gear, the inventor says, an a.c. motor can now be used direct for variable speed shaft driving and thus does away with the need for d.c. motors and transformers.



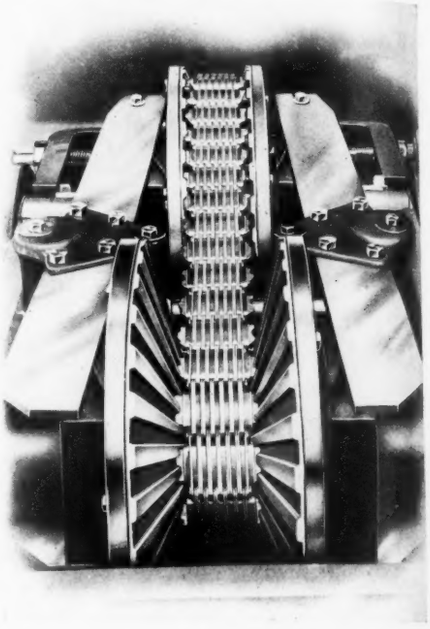
Position of driving chain at maximum diameter of the expansion disc pulley

While applicable in every industry where power is used, it should be of particular interest to the quarrying and cement industries, where accurate speed control and driving for the crushers, conveyors and the cement mill machinery is necessary.

The following data are from the inventor's description:

The essential principle of the "P. I. V." gear is the use of a driving chain of special construction, at any centers, down to only a few inches if necessary, which in the standard designs runs between expanding pulleys of the opposed conical disc type, sloping on the inner faces to the center, which are broader at the periphery and narrower at the hub, while also the two faces are so arranged that a rib is always opposite a groove. The chain is engaged at the edges by these ribs, which act as teeth, in such a manner that the drive is truly positive, quite different to any smooth device dependent on friction, which may result in slipping. The construction of the chain is on ingenious and unusual lines, having links connected by rivets as usual, but a longitudinal slot is punched through each of these links in which is fitted a sleeve filled with small thin steel plates or slats fixed vertically and loose in the sense that they can move in a direction at right angles to the travel of the chain. Also the slats project on either side, and as a link enters the "V" of the pulleys the ribs or teeth of one pulley face push the requisite number of slats across into the spaces between teeth on the opposed pulley face so that the chain always engages positively in all positions with the driving pulleys, just as much as an ordinary roller chain and sprocket wheel.

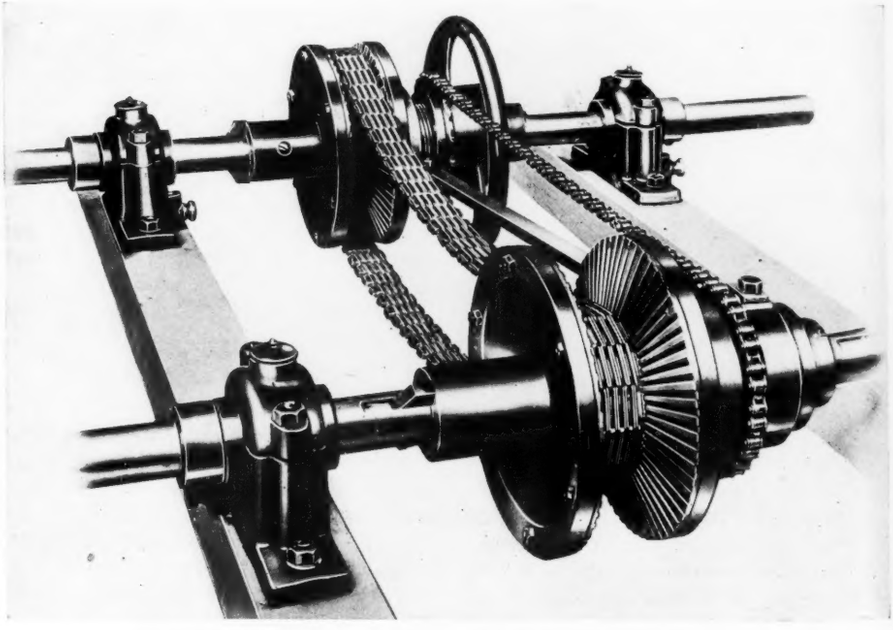
In order to alter the speed of the driven shaft, all that is necessary is to slide the halves of each of the pulleys along the shafts to a very slight extent, using a common lever or handle. On one shaft the two halves are brought close together, and the chain, being of course always the same width across the slats, therefore rises automatically in the grooves, giving the same effect as a pulley of a large diameter, while the other pulley, on being correspondingly widened out, causes the chain to sink deeper in the grooves. In this way the speed alteration obtained between the two shafts is infinite within the range of the gear and at the same time perfectly smooth in action, while, as indicated, the whole arrangement can be contained in a small enclosed box,



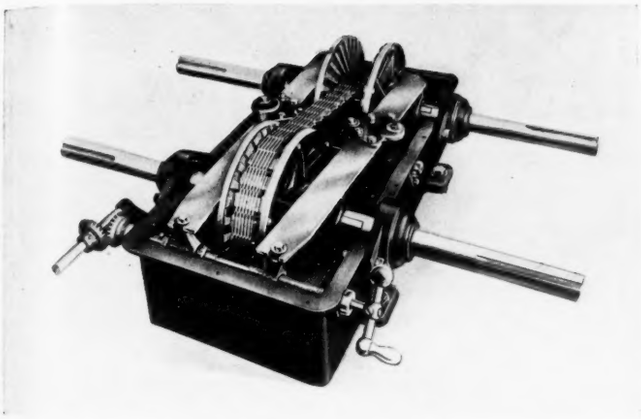
Pulley set at minimum diameter. Note how the driving chain engages in the grooved sides or ribs of the pulley

running in oil and quite impervious to heat, dust, gases, or other deleterious influences.

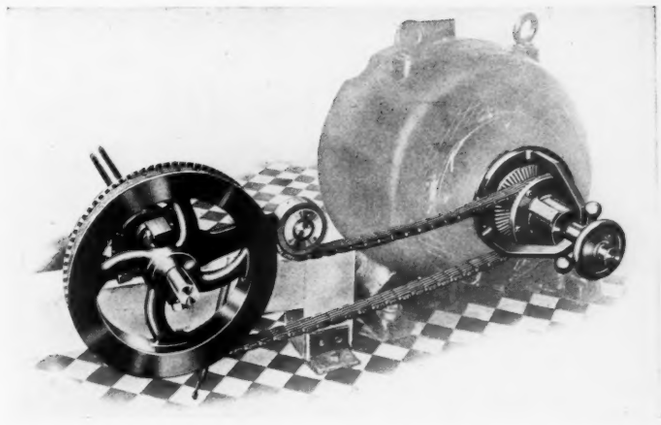
The gear is designed to run with the *slack* side of the chain uppermost. A spring



Ordinary open drive between two shafts at long centers



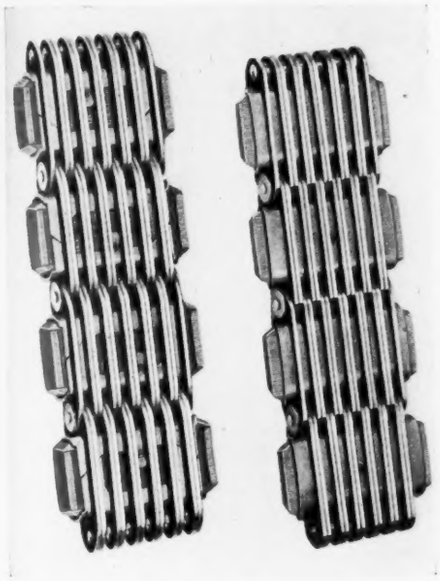
Special gear box built using the new variable speed device. The speed control handle shows at the lower right



Open chain drive with a.c. motor. Changes in speed ratios are made by adjusting the wheel valve shown on motor shaft

loaded shoe riding on the slack side, between the pulleys, serves to maintain an automatic compensation for the extension of the chain due to possible wear and to the alteration of the free length due to variation of the gear ratio.

The "P. I. V." gear with a long center open drive is on the same principle, and the corresponding a.c. motor drive as a rule has only one "P. I. V." pulley, which may be fitted on either shaft with a grooved fixed pulley opposite, although of course also two "P. I. V." pulleys may be used if desired.



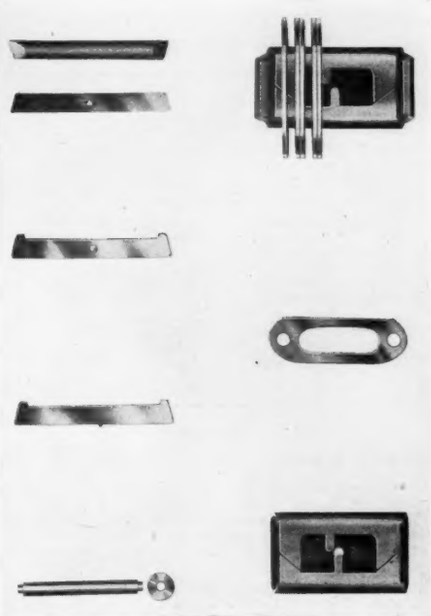
Front and back of the linked driving chain

As showing the possibilities of this invention, the smallest short center standard gear (rated transmission up to 5 hp.) is contained within a totally enclosed iron box, forming also an oil bath, as usual, which is only 20½x13½x10 in. This allows of an infinite number of speed variations being given, as adjusted by a single handle, to a drive shaft between the range of 300 and 1800 r.p.m., that is a 6:1 ratio, with a driving shaft running at a steady speed of 750 revolutions.

Also an open "P. I. V." chain drive at any desired long centers operating with an a.c. motor, as already indicated, allows of an infinite number of speed variations to be given to the driven shaft. For example, in a given case the motor runs at 1000 r.p.m. and the driven shaft could be varied smoothly and noiselessly within the range of 250 to 500 r.p.m. merely by operating a wheel control on the end of the motor shaft.

Detailed tests on the gear carried out at the British National Physical Laboratory, Teddington, London, are said to have shown it to have a high rate of transmission efficiency. The figures given are as follows: 91% when the driven shaft is at 375 revolutions and the driving shaft at 750 revolutions (1:2) and 95% at even speeds (1:1), while the temperature rise is negligible.

There are said to be a considerable number of these gears in successful operation in Great Britain. The world rights for manufacture are in the hands of Close Bros., Ltd., 7 Moorgate, London, Eng., bankers, who expect to establish in a short time an American company to manufacture the gear in the United States.



Details of the chain

New Rotating Cam Switch

THE Electric Controller and Manufacturing Co., Cleveland, Ohio, announce a new rotating cam limit switch to be used with magnetic controllers for the automatic control of machines having such fixed sequence of operation as slowing down, stopping and reversing.

This cam type limit switch is totally enclosed, is equipped with tapered roller bearings and is designed to carry up to six sets of contacts. The cams which operate the opening and closing of the contacts, are each adjusted inidependently of the others and can be fixed at a number of positions, thus giving flexibility to the machine with which it is used.

Improved Recording Instrument

FOUR new features have been incorporated in the CR type round pattern recording instruments, according to the General Electric Co., Schenectady, N. Y. The new pen, it is said, is of greater capacity, with a glass body and metal stylus, and can be refilled without impeding the operation of the instrument. There is a new shipping device, operated by turning a knurled knob on the back. A new polarizing adjustment, by which the instrument calibration can be altered, can be locked in any desired position. There is also a new suspension link of indestructible character, by which the calibration and sensitivity of the instrument are retained, the manufacturers claim.

The CR recording instruments, for either alternating or direct current, are available for switchboard mounting or as portable instruments. The ammeters are for 5 to 200 amperes, and the voltmeters are supplied for any range from 0 to 750 volts. The charts, 8 in. in diameter, are driven by one-day or eight-day clocks or by Warren synchronous motors.

News of All the Industry

Incorporations

Buffalo Gravel Corp., Buffalo, N. Y., merges with Berder Island Co.

Gonzales Cement Works, Gonzales, Tex., increased capital stock from $65,000 to $110,000.

Independent Gravel Co., Seattle, Wash., $100,000. R. E. L. Thomas, David E. Sayre, Ivan L. Hyland.

Cooper Crushed Stone Co., Plymouth, Pa., $50,000. George P. Cooper, Myer Friedman, Emil Rothman.

Perfection Gravel Sales Co., Inc., Shreveport, La., $50,000. T. G. Roberts, J. W. Sanders, 1038 Sheridan Ave., and others.

Maclay Rock Co., Los Angeles, Calif., $150,000. Robert O. Meighan, M. N. Barnes, D. L. Hunter, J. A. Hazen and W. C. Tyson.

Certified Sand Co., New Haven, Conn., $100,000. Ray J. Reigeluth, Harold C. Blakeslee, Albert L. Worthen and Milton C. Mapes.

J. U. Schickli & Bros., 21st and Greenwood, Louisville, Ky., concrete products, increased capital stock from $40,000 to $75,000.

Mantua Sand and Gravel Co., Mantua, O., $5,000. A. W. Heinrich, T. R. Bateman, A. R. Klein, A. A. Kaiser, J. R. Louis.

Wapakoneta Cement Block Co., Wapakoneta, O., $35,000. F. L. Howell, M. H. Woodruff, J. H. Howell, Bess Tucker, Ruth Headapohl.

Frank J. Boland, Inc., Union, Broome County, N. Y., $100,000. F. J. Boland, 2 Grand Ave., Binghamton. Granite, stone, gravel, building materials.

Ohio Lime Products, Inc., Cleveland, O., 1000 shares, no par value. L. Petrash, J. W. Woods, Marie Schwan, Catherine Carroll, Herman Schmidt.

C. D. F. Cement Block Corp., New York City, N. Y., $15,000. J. Ciabattari, C. Valdata, A. Ancilotti. (Filed by B. R. Leinhardt, 44 Court St., Brooklyn.

Independent Limestone Co., Bedford, Ind., $200,000. Jesse G. Ray, Henry Struble and Frederick D. Norton. To operate quarry and crushed stone plant.

Radio Cement Block Co., New York City, N. Y., $10,000. B. Levy, B. Dasheff, J. J. Dowd. (Filed by Okeshken Brothers, 189 Montague St.) Building materials.

American Marble & Granite Co., Sylacauga, Ala., $50,000. Officers: President, Tucker Baker; vice-president, J. P. McLeer; secretary-treasurer, Thomas L. Hagan.

Scotia Stone and Gravel Co., Schenectady, N. Y., 1,000 common, no par. L. and A. Lantanzio, H. E. Blodgett. (Filed by Blodgett and Smih, Schenecady.)

Margerum Rock Asphalt Block, Inc., Tampa, Fla., 5000 shares, par value $100 each. Board of directors: H. L. Bowlby, R. W. Sanders, H. T. Lykes. To deal in building material.

Beyer Crushed Rock Co., Kansas City, Mo., $90,000. W. M. Beyer, Maggie Beyer, Louis Marino. To manufacture and deal in stone, gravel and materials for building streets, etc.

Sierra Lime Co., Sacramento, Calif., $100,000. Directors: Allen F. Grant, J. F. Dunasky, and Charles J. Eastman. To trade in lime and lime products and to mine rock and marble.

Freeman Stone and Gravel Co., Inc., Norfolk, Va., $1,000 to $5,000. M. W. Freeman, president; F. M. Freeman, secretary, and W. H. Freeman, all of Norfolk. To buy, sell and deal in sand, gravel, stone, and sand clay gravel. Attorneys, Merrill and Machen, Norfolk.

Ulin Crushed Stone Co., 111 W. Jackson Blvd., Chicago, Ill., $350,000. Orlando F. Scott, O. S. Scott, R. W. Sanderson, Harry Culver, I. Katz. (Correspondent: Murphy O. Tate, 3183 S. Clark St.) To deal in leaseholds, develop and work stone quarries and quarry sites.

Illinois Silica Co., Cairo, Ill., $75,000. A. M. Davis, T. J. Peterson, E. C. Sheiden. (Correspondent: Moses, Kennedy, Stein & Bachrach, 231 S. La Salle St.) To mine, mill, manufacture and sell soft or amorphous silica and other minerals, clays and allied products.

Buchholz Concrete Co., Meyers Road, Lombard, Ill., $20,000. Elsie Kolb, Elda Buchholz, Paul E. Kolb and William C. Buchholz. (Correspondent: Theodore A. Kolb, 7 S. Dearborn St., Chicago.) To deal in and manufacture building materials and conduct general contracting.

Quarries

Dolomite Products Co., 1110 Euclid Ave., Cleveland, O., producers of fluxing stone, crushed stone and agricultural limestone, announce that effective January 3, 1927, Dolomite, Inc., became its successor. The succession, it is advised, is accompanied by no changes in ownership, management, policies or products.

Belle Center Stone Quarry, Belle Center, Ohio, of which John E. Osborne is proprietor, will add a small reduction crusher.

R. V. Storer and A. E. Hogquist, who are operating six quarries in Minnesota, plan the opening of a new quarry in the black granite deposits of Mellen, Wis. The proposition, it is said, will mature next spring, and will include a finishing plant to cost about $100,000.

Glenwood Granite Works, Glenwood, Iowa, has begun the erection of a $3,000 addition to its business building, according to a report.

D. J. Butts has engaged in business at 2710 Frederick St., Los Angeles, Calif., as Pacific Rock Products Co.

Sand and Gravel

Iron City Sand and Gravel Co., Pittsburgh, Penn., is said to have been awarded the wharf lease on river shore property on the south side of the city by the city council, with a proposal to pay $10,000 down, $5,000 within five months, and to assume a $29,483.52 obligation to be paid in three equal installments.

Capt. E. T. Slider, head of the E. T. Slider Co., Louisville, Ky., river sand and gravel dredgers and large handlers of river coal, has purchased the O. K. Supply House property at 310 E. Market St., New Albany, Ind., including a one-story frame building and two-story brick. No announcement has been made regarding plans for the property.

Koch Sand and Gravel Co., Evansville, Ind., recently purchased the steamer, William Eichel, at a sale conducted by the United States marshal at Paducah, Ky., according to an announcement made by Bert Koenig, general manager of the Koch company. The boat, which was formerly the property of the Evansville Sand and Gravel Co., now in receivership, will be taken to Evansville at once, it was stated by the new owners. It will be added to the already large fleet of the Kich Sand and Gravel Co.

Lime

Eureka Limestone Co., Inc., Hot Springs, Ark., recently incorporated for $100,000, is said to have nine acres of land to be developed. Stone crushers and pulverizers, electric motors, hoists, cable, stone hammers and box-car loaders will be installed for making ground limestone. The daily output it is expected will be two to four carloads.

Independent Limestone Co., Bedford, Ind., recently incorporated for $200,000 as announced elsewhere on this page, is said to have purchased 87 acres on the Rockport road in Vanburen township near Bedford and will open a quarry and develop the property. Offices have been established in Bedford. Jesse G. Ray of Chicago has been elected president of the company; Henry Struble, Chicago, vice-president, and Frederick Norton, secretary-treasurer.

Cement

Northwestern States Portland Cement Co., Mason City, Iowa, distributed $28,000, it is said, in Christmas bonuses to its employes. The bonus went in varying amounts to each of the company's 400 employes, some of them receiving as much as $125.

Trinity Portland Cement Co., Dallas and Ft. Worth, Texas, recently celebrated the moving of a solid trainload of cement into the Rio Grande valley by holding a banquet in Harlingen, Texas. The guests included men connected with the building trades, newspaper men, chamber of commerce executives and others. H. D. Harger, valley representative of the company, was host at the banquet, assisted by H. W. Bryant, sales manager, of Dallas, and F. R. Horton, traffic manager.

The trainload of cement was made up of 48 cars and was approximately 1000 net tons of cement, making, it is said, the largest single shipment of cement ever made in Texas. The train originated at the Eagle Ford (Dallas) plant of the Trinity Portland Cement Co. and was billed to Harlingen, where it was broken up for distribution throughout the towns in the valley.

Pacific Portland Cement Co., Consolidated, San Francisco, Calif., will hold the annual meeting of its stockholders in San Francisco, January 28, in room 824 Pacific Bldg. Harry T. Batello is secretary and treasurer.

Cement Products

Texas-Neches Tile Co., 670 Sabine Pass Ave., Beaumont, Texas, it is said, plans establishing a business of tile, marble, terrazzo contracting and manufacturing of pottery, flower urns, vases, etc. Prices and samples and freight rates on everything entering into the above line of work are wanted. Information is also desired on machines to hold fancy shapes of carborundum stones to be used in getting out bases, coping, nosing, etc.; also small sandblast outfits to put fine finish on cement art objects.

John R. McNeal and Henry Vance, Pearson, Ga., are reported to have leased a plot of land and the sand removal privileges at Ricketson bay, about three miles from Pearson. They will erect a plant for manufacturing cement building blocks, with a capacity of turning out 600 blocks a day.

Porter-Roberts Real Estate Co., 800 Vandiver Bldg., Montgomery, Ala., plans installing a plant for the manufacture of cinder-concrete blocks.

L. V. Trueman, Milton, Fla., is planning establishment of a plant for the manufacture of concrete building units.

Lycoming Duntile Co., South Williamsport, Pa., are planning to start the manufacture of concrete blocks, according to a report. A building at 1500 West Southern Ave. has been leased and machinery is being installed at the present time. Local capital is said to be interested. A. R. Millhouse, treasurer, is also general manager.

Gypsum

Rumford Chemical Co., Rumford, R. I., manufacturers of gypsum blocks, is said to have plans for the construction of an addition to its plant. The cost is estimated at $40,000.

Silica Sand

Lake Weir Silica Products Corp., Ocala, Fla., reports that electric drives have just been installed at its dredging plant at Lake Weir, and also Link-Belt washing machinery.

Talc

Harford Talc Co., Inc., Baltimore, Md., is contemplating the installation of 3000 ft. cableway, using galvanized cable and the necessary steam boiler and accessory equipment for maintenance.

Miscellaneous Rock Products

A. D. Wilson, Eufaula, Ala., has opened a new bauxite crushing plant, it is said.

American Fertilizer and Chemical Works, San Saba, Texas, is now having plans prepared for

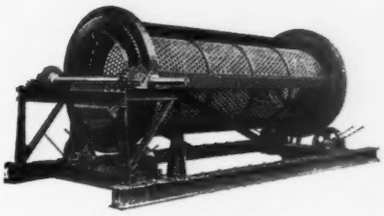
Crushing Plant Equipment

The many crushing plants which have been completely equipped by the Allis-Chalmers Manufacturing Company is evidenced by the satisfactory service which these plants are giving. The Allis-Chalmers Manufacturing Company takes the entire **responsibility** for the design of the plant and its equipment. These plants are built on the highest engineering standard following the best engineering practices.

Our Engineers are at your service to make complete installation drawings

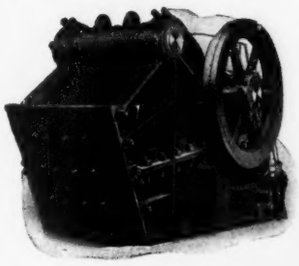
Gates No. 27 Gyratory Crusher, having two openings, each 54 in. x 141 in.

The Gates Style K Crusher, which has been developed in all sizes, is the result of 40 years' accumulated experience of the engineers and designers of the Gates Iron Works and the Allis-Chalmers Mfg. Co.



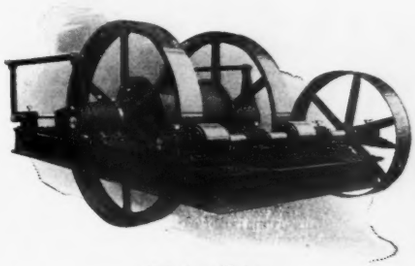
All Iron Frame Screen

The durability, simplicity and efficiency of the Gates Patented All-Iron Frame Screens is unequalled by any other screen on the market.



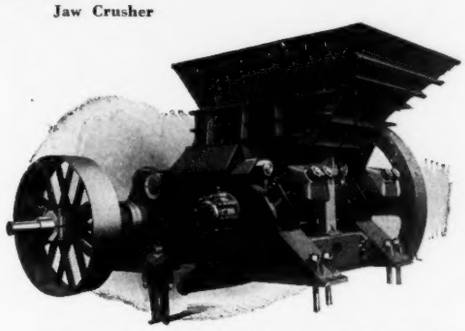
Jaw Crusher

The company has also developed in all sizes Jaw Crushers for crushing copper ore, blast furnace flux and ballast stone.



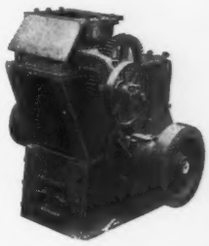
Friction Hoist

Friction hoists are the simplest and most effective devices for handling dump cars in a crushing plant. They are constructed single and double friction, with a maximum drum diameter of 36".



60 in. x 48 in. Fairmount Type (or Single Roll) Crusher

The Fairmount Crusher is intended to crush limestone, dolomite, phosphate rock, magnesite and other less tenacious rocks. It is not suitable for, nor do we recommend it for granites, trap rock or other igneous rock.



Pulverator

The Allis-Chalmers Pulverator is a crushing and pulverizing machine designed on a new principle. It is designed as a crusher for the reduction of material from 3 inches or finer to a size of which all will pass a 20-mesh screen if necessary. The materials which it handles to advantage include limestone for cement making, concrete, agricultural purposes, etc., coal, shale, felspar, phosphate rock, gypsum, bauxite, slag and similar substances.

Write for Our Bulletins

ALLIS-CHALMERS PRODUCTS
Electrical Machinery
Steam Turbines
Steam Engines
Gas and Oil Engines
Hydraulic Turbines
Crushing and Cement Machinery
Mining Machinery

ALLIS-CHALMERS MANUFACTURING COMPANY

MILWAUKEE, WISCONSIN. U.S.A.

ALLIS-CHALMERS PRODUCTS
Flour and Saw Mill Machinery
Power Transmission Machinery
Pumping Engines-Centrifugal Pumps
Steam and Electric Hoists
Air Compressors - Air Brakes
Agricultural Machinery
Condensers

the construction of the new plant it proposes to build within the near future, as announced in the January 8 issue of "Rock Products." The plans are said to call for a four-story plant, to be operated by electric power, and equipment to be of the most recent and modern design. Hydrated lime and calcium arsenate will be manufactured for agricultural purposes. First reports estimated the cost of the plant at $30,000, but a later report states $150,000.

National Potash Co. of America, 100 North Parsons St., New York, N. Y., is reported to have plans under way for development of 12,000 acres of land with potash deposits at Sonora, Texas. Shafts are to be built, it is said, and a plant constructed. Machinery will be required.

Kansas City Asphalt Mining and Milling Co., Kansas City, Mo., is planning the development of its 480 acres at Liberal, Mo. According to reports, hoist, crusher and rolls have already been purchased and will be installed. W. H. Simpson is construction engineer.

Asbestos Shingle, Slate and Sheathing Co., Ambler, Penn., new plant at Asbestos Station, Pennsylvania R. R., near Ambler, has gone into production and is operating 24 hours a day. The plant has been equipped for the manufacture of the shingles which are to be sold throughout the United States. The manufacture of the other types of uniform thick asbestos shingles, corrugated asbestos roofing and asbestos lumber will be continued at the company's Ambler plant, which is now running at capacity.

Peninsula Phosphate Co. is said to have recently sold its mining property, located at Fort Meade and known as the Jane Jay mine, at a master's sale at Bartow, Fla., to J. J. Nelligan, president of the Safe Deposit Trust Co. of Baltimore, Md. The property consists of 600 acres of phosphate land, buildings and machinery.

Personals

R. S. Slattery, formerly sales manager of the southeastern division of the United States Gypsum Co., has been promoted to the same position in the eastern division. R. C. Van Deusen, who was formerly supervisor for the company on the Pacific coast, has been appointed to succeed Mr. Slattery as sales manager of the southeastern division.

Henry F. Koch, president of the Koch Sand and Gravel Co., Evansville, Ind., has gone to Florida to spend the remainder of the winter. Bert Koenig, general manager, has been appointed on some of the important standing committees of Hadi Temple of Shriners at Evansville for the coming year.

Fred S. Doran has been appointed manager of the Cleveland plant of Joseph T. Ryerson and Son, Inc. This new warehouse plant of the Ryerson company was purchased from the Bourne-Fuller Co., Cleveland, Ohio, on January 3, 1927.

Mr. Doran has been associated with Joseph T. Ryerson and Son for 21 years. Beginning in the office he traveled the Wisconsin territory for five years, then covered the Chicago city territory for some time until he was made assistant to A. M. Mueller, general manager of sales.

B. H. Lytle has been appointed manager of the Central Sales Division, Hyatt Roller Bearing Co., Newark, N. J. His headquarters will be at 808 Fulton Bldg., Pittsburgh, Penn.

B. H. Lytle

Mr. Lytle is a native of Pittsburgh. He joined the Westinghouse organization there shortly after his graduation from Carnegie Tech. After spending a year in their shops he entered the engineering department, and for five years worked on design and general problems. He was then transferrrd to Westinghouse headquarters sales, and remained there nine years, the last three of which were in the capacity of manager of the substation section of the Power Department. The past two years he has been concerned with district sales in the Philadelphia office.

This new appointment places Mr. Lytle in charge of the sale of Hyatt roller bearings for all applications in the Central Division, except automotive.

M. B. Urquhart, who has been northwestern manager for the Keystone Lubricating Co. of Philadelphia, Penn., for the past 20 years, has resigned his position with this concern and on January 1 assumed the western management of the Philadelphia Grease Mfg. Co., Philadelphia, Penn., with offices and warehouses located in the Ideal Bldg., Denver, Colo., and 144 South Fifth West St., Salt Lake City, Utah.

T. L. Burrell of the Burrell Engineering and Construction Co., Chicago, Ill., has returned to active participation in the sales organization of the company after a year's leave of absence in the South.

Obituaries

C. E. Green, vice-president and general sales manager of Midwest Air Filters, Inc., Bradford, Penn., died suddenly on December 18.

George Simpson, for many years chief engineer of the Poole Engineering and Machine Co., Baltimore, Md., died on December 18, aged 79 years. Mr. Simpson was born at Smithfield, Va. At an early age he became associated with his uncle, the late Robert Poole, in Poole and Hunt, afterward the Poole Engineering and Machine Co. He soon became chief engineer of the company, which position he occupied for a number of years until he resigned in 1896 to become supervising engineer for the Farrel Foundry and Machine Co., Ansonia, Conn.

George Newbold, 39 years of age, formerly of Louisville, president of the Sherman Concrete Pipe Co., Knoxville, Tenn., died in that city on Saturday, January 15. His funeral was held on January 16 at Louisville. Mr. Newbold graduated from the Louisville high school and later from Swarthmore College. He left Louisville 11 years ago for work at Knoxville with the Louisville & Nashville R. R. He later became associated with the Sherman company, and eventually became its president. He is survived by his widow, father, small son and daughter, and one sister.

Samuel P. Bawden, 62, chief engineer of the Warren Sand and Gravel Co., Inc., Easton, Pa., recently died in the Easton Hospital here from injuries sustained when he fell from a tower at the plant of the company at Carpenterville, N. J., where he was assisting in the removal of machinery. He lost his balance as he reached for a rope, and fell about 75 feet to the ground.

Manufacturers

Kent Machine Co., Kent, Ohio, announces the opening of a Chicago office at 625 Monadnock Bldg., with F. E. Schwalb as manager and sales engineer. Mr. Schwalb was formerly connected with the Weller Manufacturing Co. in the capacity of chief engineer. His experience in the material handling field also includes that of designing engineer, supervisor of design, and chief construction engineer.

Westinghouse Electric and Manufacturing Co. announces a complete reorganization of the engineering department at the East Springfield plant to obtain a better concentration of engineering personnel and facilities. Increasing growth and importance of the East Springfield plant has made this change necessary.

C. H. Garcelon, formerly manager of the small motor engineering of the East Pittsburgh works has been appointed manager of engineering of the East Springfield works. C. A. M. Weber has been appointed manager of the small motor engineering department, East Springfield works, and E. W. Denman has been made section head in charge of the fan motor section of the small motor engineering department.

Le Roi Co., Milwaukee, Wis., has taken over the gasoline engine business formerly conducted by the Beaver Mfg. Co., Milwaukee. With Beaver's line of gasoline engines the Le Roi company will now manufacture gasoline engines ranging in horsepower from the small 3 to the 160.

Cleveland Worm & Gear Co., Cleveland, Ohio, has established a district sales office in Detroit, Mich., at 2600 Buhl Bldg., with H. A. Sparrow in charge as district manager. This office will serve the lower peninsula of Michigan and handle all matters pertaining to the application of the standard industrial worm gear reduction unit manufactured by the company.

Harnischfeger Corp., Milwaukee, Wis., announces the removal of its branch office at Jacksonville, Fla., to 509 East 8th St. F. W. Truex is branch manager in charge. After March 1, the Jacksonville branch warehouse will also be moved to 509 East 8th St.

Dings Magnetic Separator Co. has established an office at Boston, Mass., in charge of George H. Walsh. The new office is located at 304 Rice Bldg.

Patterson Foundry and Machine Co., East Liverpool, Ohio, announce the following new appointments: Ernest E. Hayes, Chicago, Ill., as central sales manager with headquarters at Chicago. Mr. Hayes' territory will include Milwaukee and vicinity.

John S. Scott, secretary of the company, who has temporarily looked after its interests in the Chicago territory, has already turned the reins over to Mr. Hayes. Mr. Scott will have his headquarters at the main office in East Liverpool and will still handle the territory from Philadelphia west to Kansas City but south of Chicago and Milwaukee.

C. H. Armstrong remains as general sales manager with headquarters at East Liverpool. J. B. Harvey is eastern sales manager with headquarters at 30 Church St., New York City. G. C. Stoll is western sales manager with headquarters in the Higgins Bldg., Los Angeles, Calif.

The company will in January, 1927, celebrate its sixty-fifth birthday. The original company's firm name was the Boyce Foundry & Machine Works and some fifteen years after its inception, the Patterson Foundry & Machine Works was founded

E. E. Hayes

C. H. Armstrong

as a competitive concern. In 1899 the Patterson Foundry and Machine Co. was organized and bought out the Patterson Foundry & Machine Works and the Boyce Foundry & Machine Works, and the business has continued without interruption since its inception.

William Ganschow Co., Chicago, announce the appointment of Curtis and Burgess, 1432 Syndicate Trust Building, St. Louis, as their representatives in the St. Louis district. Curtis and Burgess are replacing O. T. Barnidge.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Light Drill Steel Sharpener. Bulletin 72-I illustrating and describing type "C" all hammer drill sharpener manufactured by SULLIVAN MACHINERY CO., Chicago, Ill.

Piston Pumps. Bulletin featuring "Flud-Oil-D," high pressure single acting pump for water pumping. NOVO ENGINE CO., Lansing, Mich.

Power Engines. Bulletin K describing power units for driving sand pumps and rock crushers. Tables and data on power requirements, illustrations of operations, etc. CLIMAX ENGINEERING CO., Clinton, Iowa.

General Electric Bulletins. **GEA-570** on hand-starting compensators for squirrel cage induction motors, two- and three-phase; **GEA-569** on constant potential arc welding sets.

Portable Compressors. "One Hundred and One Ways to Save Money," fifth edition, revised. Information on the general instruction, mountings, equipment and details of air compressors and air-operated tools. Cost data on operation of various equipment for different purposes. Illustrated throughout. 111 pp. INGERSOLL-RAND CO., New York, N. Y.

Lock-Seam Pipe. Catalog on Naylor spiral "Lock-Seam" pipe for conveying materials, liquids, etc. Useful information and data on design, capacities and on pipe selection. Illustrated. NAYLOR SPIRAL PIPE CO., Chicago, Ill.

Sand and Gravel Equipment. Bulletin SG-12 on revolving screen, chain type bucket elevator, drag type settling tank and assembled unit. Illustration details and data on design and capacities. MORROW MANUFACTURING CO., Wellston, Ohio.

Welding and Cutting Apparatus. Catalog 172E describing and illustrating equipment for that purpose manufactured by the ALEXANDER MILBURN CO., Baltimore, Md.